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Studies on the Caprellidae (Crustacea, Amphipoda) of the American North Pacific

by Diana R. Laubitz

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STUDIES ON THE CAPRELLIDAE (CRUSTACEA, AMPHIPODA) OF THE AMERICAN NORTH PACIFIC

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STUDIES ON THE CAPRELLIDAE (CRUSTACEA, AMPHIPODA) OF THE AMERICAN NORTH PACIFIC

by Diana R. Laubitz

Ottawa, 1970

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Résumé

Le présent ouvrage décrit vingt-six espèces de Caprellidae du littoral nord-américain du Pacifique, appartenant à huit genres différents. Ce nombre comprend un genre nouveau, *Pseudoliropus*, et six espèces nouvelles: *Cercops compactus*, *Mayerella banksia*, *Caprella pilidigita*, *C. rudiuscula*, *C. pustulata* et *Pseudoliropus vanus*. L'auteur traite de la zoogéographie de la région et expose certains facteurs écologiques qui influent sur la répartition des caprellidées dans cette région.

Summary

Twenty-six species of Caprellidae, representing eight genera, are described from the North American Pacific region. Included are one new genus, *Pseudoliropus*, and six new species: *Cercops compactus*, *Mayerella banksia*, *Caprella pilidigita*, *C. rudiuscula*, *C. pustulata*, and *Pseudoliropus vanus*. The zoogeography of the region is discussed, and certain ecological factors affecting the distribution of the caprellids within this region have been noted.

Introduction

Since Mayer's monographic works (1882, 1890, 1903) on the caprellid amphipods first revealed the diverse nature of the North American Pacific fauna, few studies have been published on the systematics, distribution, or ecology of these animals.

Holmes (1904) confined his studies to the Prince William Sound and Aleutian Island region of Alaska, and (1909) recorded only one species, from California. La Follette (1914, 1915) and Shaw (1916) published accounts of seven species from Laguna Beach. Wailes (1931) included two caprellid species in a general list of intertidal amphipods from British Columbia. Johnson and Snook (1927) and Ricketts and Calvin (1952) included brief descriptions of a few species of caprellids from the general North American Pacific area. Dougherty and Steinberg (1953) studied the caprellids of California between latitudes 36°N and 38°N and listed twenty species, including two new species. Saunders (1962, 1966) has done some interesting work on the ecology and behaviour of a few species, and has identified eleven caprellids from the San Juan area.

Study of these works shows that, apart from Mayer, no one has investigated the caprellids of the North American Pacific region as a whole, and that large parts of this region, e.g., Oregon and British Columbia, have never been investigated. It is perhaps surprising that more than thirty species of caprellids have been recorded from this region despite the lack of thorough study.

In contrast, much work has been done on the caprellids of the corresponding region of the western Pacific. Arimoto (1929, 1930, 1931, 1934) and Utinomi (1931, 1937, 1943, 1947) in Japan, and Gurjanova (1933), Kudrjaschov and Vassilenko (1966), Schurin (1935, 1937), Stschapova, Mokyevsky, and Pasternak (1957) and Vassilenko (1967) in Russia, have published on the caprellids of the Sea of Japan and the northwestern Pacific, and have listed over sixty species of caprellids from this region. It is apparent that, as is the case with other animals (Ekman 1953), the North Pacific caprellid fauna is very rich, and it can be expected that more intensive investigation will show the North American fauna to be nearly as diverse as the Japanese fauna.

New material has become available that further extends our knowledge of the range and numbers of caprellid species in the North American Pacific. During the period 1955–1966 inclusive, Dr. E. L. Bousfield (1956, 1961, 1963, etc.) of the National Museums of Canada made summer collections of crustacea and other invertebrate animals from the Pacific coast, from Oregon, at approximately latitude 44°N, north to Prince William Sound and Seward, Alaska. Caprellid amphipods from these intertidal invertebrate collections were studied as well as those from general collections made by other National Museums of Canada investigators, and from collections in the United States National Mu-

seum, from the same geographical region. Although no special effort had been made to collect caprellids during these surveys, 171 of the 502 localities did contain caprellid material, which yielded twenty-six species in eight genera.

The purpose of this paper is, therefore, to describe all the species recorded in this new material; to construct a key for the identification of these species; and to reach a tentative conclusion on the effect of temperature and salinity on the distribution of these animals, with a view to predicting which areas should be particularly rewarding in future study.

It has been found that in the American Pacific between latitudes 40°N and 60°N, approximately, general intertidal collections contained twenty-six species of caprellid amphipods, six of which were new to science. Two of the eight genera, *Cercops* and *Mayerella*, are new to this region, and one, *Pseudoliropus*, is new to science. Knowledge of the ranges of twenty species has been extended. Although most of the species found had extensive ranges within this region, due to the general uniformity of temperature, more specific indications of the effects of local temperature and salinity values have been noted for the commoner species.

It has also been noted that of the forty caprellid species recorded from the boreal region of the American Pacific, eleven are found also in the northwestern Pacific, two are found also in the Atlantic, and twenty-seven of the species are apparently endemic.

The author thanks the National Museums of Canada for making this study possible, particularly Dr. E. L. Bousfield for the use of collections and for his invaluable advice and criticism; Dr. John C. McCain, of Oregon State University, for his advice and for the loan of material in the United States National Museum; Dr. Marvin P. Jessen, of Grand View College, Iowa, for the use of his collection of *Cercops compactus* n. sp.; and Dr. Tetsuo Matsumura, of the National Research Council, for his help in the translation of the Japanese literature.

Illustrations

All illustrations were made to scale, using a projector. Scale is shown only for the whole mount, where it equals 1 mm unless otherwise indicated.

Key to symbols used:

A	= antenna	MDP	= mandibular palp
ABD	= abdomen	MX	= maxilla
BR	= brood plate	MXPD	= maxilliped
GN	= gnathopod	P	= pereopod
HD	= head	PEN	= penis
LFT	= left	PER	= pereonite
LL	= lower lip	RT	= right
MD	= mandible	UR	= uropod

Maps

These show the known distribution of the species within the region under consideration. The closed circles indicate localities from which specimens were examined. The closed triangles indicate references in the literature.

Collecting Stations

Detailed locality data has not been given for most of the species here described. NMC Expedition Station Lists have been published for nearly all the stations cited (Bousfield 1956, 1963, 1968, in prep., . . . and McAllister 1962).

The five unpublished stations are as follows:

3532, 1935. July 1, 1935. Skidegate Channel, Queen Charlotte Islands.

JWS 85 August 6, 1965. Lawn Point, B.C., latitude 53° 32′ N, longitude 131° 09′ W. 30 fm.

JWS 92 August 8, 1965. Queen Charlotte Islands, latitude 51° 05′ N, longitude 132° 22′ W. Trawl, 1550 fm.

NAP66-201 July 16, 1966. Whiffin Spit, Sooke Harbour, Vancouver Island.

WVV 1966 August 30, 1966. Dixon Entrance, B.C., latitude 54° 16′ N, longitude 132° 40′ W. Dredge, 80 fm.

Measurements

All measurements were made by recording the distance from the anterior of the head, between the points of attachment of the two pairs of antennae, to the posterior tip of the abdomen, through the longitudinal mid-line of each pereonite. The lengths recorded for each species are of the largest male found and of an average large ovigerous female.

Family CAPRELLIDAE

According to Stebbing (1906):

> Head fused with 1st segment of peraeon. Palp of maxilliped 1- to 4-jointed. Peraeon often with fewer than 7 pairs of legs; 2, rarely 3, segments of peraeon with branchial vesicles; 2 segments of ♀ with marsupial plates; 1st joint of gnathopods and peraeopods wanting. Pleon and its legs rudimentary. Eyes small, 1 pair. Hepatopancreatic tubes 2; rectal glands none. Heart with 3 pairs of ostia. Posterior ganglia of nerve-chain very small, none situated in pleon.

All specimens examined by the author showed at least a part of the suture between the head and pereonite I, indicating that even in the most advanced forms (e.g., *Caprella*) the fusion between these parts is not complete. All specimens have coxal plates on the gnathopods, and usually also on pereopods 5, 6, and 7. Stebbing's family definition is therefore not satisfactory and must be changed to read: "Head often partially fused with first segment of pereon. . . first joint of gnathopods and pereopods reduced."

The Caprogammaridae (Kudrjaschov and Vassilenko 1966), which was originally included in the Gammaridea, was assigned to the Caprellidae by McCain (1968). This move is fully justified by the morphology of this genus. *Caprogammarus* and *Cercops* should probably be placed in a sub-family separate from the 'typical' caprellids, on the basis of their well-developed abdomen. However, our knowledge of how these two genera compare with other primitive caprellid genera, e.g., the *Proto* group, is at present insufficient to support such a separation.

The characters used to distinguish the genera within the family Caprellidae are those originally formulated by Mayer (1890, 1903). Some of these characters appear to be unsatisfactory, and the number of monotypic genera that have resulted suggests that too much emphasis has been placed on what may be unstable features of caprellid organization.

The characters that must be particularly suspect are the number of segments in pereopods 3, 4, and 5, and the organization of the abdomen. Their diagnostic worth cannot be fully assessed until more is known of their developmental stability and function. If the abdomen is undergoing reduction, as seems likely from its vestigial appearance in most caprellids, then its organization must not be relied on too heavily for generic diagnosis. Thus the separation of *Metacaprella* from *Caprella*, solely on the basis of the female abdomen, is highly unsatisfactory. Similarly, pereopods 3, 4, and 5 appear to be vestigial structures in many genera; for example, in *Tritella* pereopods 3 and 4 are minute and unsegmented, and in *Caprella* they are absent.

Characters that deserve further investigation are the brood plates, the second antennae, and particularly the mouthparts.

The nature and arrangement of the brood plate setae appears to be stable within each genus. It has not been possible to determine whether it is also characteristic for each genus.

The presence or absence of 'swimming' setae on the antenna 2 must be a generic character; but the organization of these setae, particularly on the flagellum, appears to be more specific (see *Tritella laevis* and *T. pilimana*).

The most useful generic characters will probably be found among the mouthparts, but there has not been sufficient study to show which are the stable characters. The presence or absence of the mandibular molar process must be at least a generic character, reflecting feeding habits. The proportions of the lobes, and probably other features, of the maxilliped, and the number of spines on the outer lobe of maxilla I, also seem reliable. However, even casual observation shows that variation does occur. Thus, while *Perotripus* normally has six spines on the maxilla I outer lobe, the specimen figured here had only four spines on one of the maxillae; Mayer (1903) recorded similar variations for other genera. Similarly, the mandibular setal row of *Caprella* appears to be stable, with two setae on the right mandible and three setae on the left; yet in *C. alaskana*, all the investigated specimens had a greater number of setae on at least one mandible.

McCain (1968) has urged a thorough examination of caprellid mouthparts. Such an investigation must include as many genera and as many individuals as possible, thereby to determine whether such variations as have been cited are truly random.

Pending such an investigation, the present system of diagnosis, derived from Mayer, will continue to be used.

The terminology used in this paper is as follows:

The cephelon is the partly fused head and pereonite I complex.

The swimming setae are the long hairs present along the lower edge of the antenna 2 peduncle, and, frequently, flagellum, in some genera. Although they are generally called swimming setae, they play a more important part in feeding than in swimming (Wetzel 1932).

The pereopods are numbered according to the pereonite to which they are attached. The first and second pereopods are the gnathopods. Despite the presence of coxal plates, the pereopods are treated as six-segmented limbs, with the propodus and dactylus being segments 5 and 6, respectively. The palm of the propodus of the pereopods, and particularly of gnathopod 2, has its own special nomenclature. The large, usually paired, spines between which the tip of the dactylus rests when closed, are the grasping spines. In *Caprella* there is usually one pair of these spines on pereopods and gnathopod 1. The configuration of the palm of the gnathopod 2 is important in the diagnosis of some species. The grasping spine, which is frequently single, may have one or more accessory spines at its base. The poison spine is so-called for historic reasons. It is the spine-like projection which is not demarcated at its base from the palm of gnathopod 2. As it is a secondary sexual character in many species (e.g., *Tritella laevis*, *Deutella californica*, *Caprella laeviuscula*), being very large in the male and minute in the female, it is doubtful that it always has a poisonous nature. However, Wetzel (1932) has shown that in some species it does appear to secrete a venom.

For the abdomen, McCain's (1968) system of discriminating between the obvious, projecting appendages, and the less developed and usually setose lobes has been used.

KEY TO THE CAPRELLIDAE OF THE AMERICAN NORTH PACIFIC

1. Gills on pereonites II, III, and IV; mandibular molar process absent 2

   Gills on pereonites III and IV; mandibular molar process present 3

2. Pereopods 3 and 4 one-segmented, pereopod 5 six-segmented; abdomen five-segmented ..... *Cercops compactus* (p. 9)

   Pereopods 3 and 5 three-segmented, pereopod 4 one-segmented; abdomen minute ..... *Perotripus brevis* (p. 12)

3. Rudimentary pereopods present on pereonites III and IV; mandibular palp present 4

   No pereopods present on pereonites III and IV; mandibular palp absent (*Caprella* and *Metacaprella*) 7

4. Pereopods 3 and 4 two-segmented; antenna 2 with no swimming setae 5

   Pereopods 3 and 4 one-segmented; antenna 2 with swimming setae (*Tritella*) 6

5. Pereopod 5 six-segmented; head with spine or tubercle; male gnathopod 2 attached anteriorly on pereonite II .... *Deutella californica* (p. 16)

   Pereopod 5 three-segmented; head smooth; male gnathopod 2 attached posteriorly on pereonite II ..... *Mayerella banksia* (p. 19)

6. Body spines anteriorly pointing; antenna 2 flagellum stout, with short setae ..... *Tritella laevis* (p. 22)

   Body spines laterally pointing; antenna 2 flagellum slender, with long setae ..... *Tritella pilimana* (p. 25)

7. Single ventral spine between the insertions of gnathopods 2 8

   No ventral spine between the insertions of gnathopods 2 11

8. Long, slender, anteriorly pointing head spine; male gnathopod 2 propodus four times as long as broad ..... *Caprella californica* (p. 49)

   No head spine; male gnathopod 2 propodus twice as long as broad 9

9. Pereonite V with lateral projections anteriorly; large antero-laterally directed lateral spines at base of gnathopods 2 ..... *Caprella equilibra* (p. 55)

   Pereonite V without lateral projections anteriorly; lateral spines at base of gnathopods 2 small or absent .. 10

10. Gnathopod 2 dactylus setose; no lateral spine at base of gnathopod 2 ..... *Caprella pilidigita* (p. 60)

    Gnathopod 2 dactylus not setose; small lateral spine at base of gnathopod 2 ..... *Caprella mendax* (p. 58)

11. Head without spine or tubercle 12

    Head with one spine or tubercle 17

    Head with paired spines or tubercles 21

12. Propodus of pereopods slender, with median grasping spines and scarcely delineated palm; male gnathopod 2 with basis much longer than propodus, and dactylus setose ..... *Caprella gracilior* (p. 62)

    Propodus of pereopods stout, with proximal grasping spines and concave or well delineated palm; male gnathopod 2 with basis shorter than propodus, dactylus not setose 13

13. Propodus of gnathopod 2 with two accessory spines at base of grasping spine. In male, gnathopod 2 propodus with antero-dorsal projections; pereonite I three times longer than head ..... *Caprella irregularis* (p. 65)

    Propodus of gnathopod 2 with less than two accessory spines at base of grasping spine. In male, gnathopod 2 propodus without antero-dorsal projections; pereonite I not more than twice as long as head 14

14. Dorsal spines or tubercles present, at least on posterior pereonites; antenna 1 more than half body length in female, more than two-thirds in male 15

    No dorsal spines or tubercles present; antenna 1 less than half body length 16

15. Sub-littoral; flagellum of antenna 1 longer than peduncle; in male, antenna 2 equal in length to peduncle of antenna 1 ..... *Caprella striata* (p. 76)

    Intertidal; flagellum of antenna 1 shorter than peduncle; in male, antenna 2 shorter than peduncle segments 1 and 2 of antenna 1 ..... *Caprella alaskana* (p. 35)

16. Gills round. In male, gnathopod 2 setose, poison spine normal. In female, gnathopod 2 attached near middle of pereonite II ..... *Caprella drepanochir* (p. 53)

    Gills long, oval. In male, gnathopod 2 not setose, poison spine enormous. In female, gnathopod 2 attached at anterior end of pereonite II ..... *Caprella laeviuscula* (p. 67)

17. Headspine an anteriorly pointing triangular projection .. 18

    Headspine an upward pointing rounded knob 20

18. Dorsal body tuberculations minute or absent, never on pereonite I; in male, gnathopod 2 attached anteriorly on pereonite II ..... *Caprella angusta* (p. 40)

    Dorsal body tuberculations obvious, present on all pereonites; in male, gnathopod 2 attached medianly on pereonite II 19

19. Body tuberculations large; in male, propodus of gnathopod 2 shorter than pereonite II ..... *Caprella verrucosa* (p. 44)

    Body tuberculations small; in male, propodus of gnathopod 2 as long as pereonite II ..... *Caprella incisa* (p. 42)

20. Head and body covered with large and small tuberculations; antenna 2 with many long swimming setae. In male, gnathopod 2 and much of body setose ..... *Caprella pustulata* (p. 72)

    Body with few dorsal tuberculations; antenna 2 with few short swimming setae. In male, gnathopod 2 and body not setose ..... *Caprella borealis* (p. 47)

21. Paired tubercles on head; female abdomen with one pair of lobes 22

    Paired spines on head; female abdomen with one pair of one-segmented limbs (*Metacaprella*) 23

22. Large dorsal spines on posterior pereonites. In male, gnathopod 2 poison spine normal; pereonite I shorter than or equal to head ..... *Caprella ferrea* (p. 35)

    Small dorsal tuberculations on posterior pereonites. In male, gnathopod 2 poison spine enormous; pereonite I longer than head ..... *Caprella rudiuscula* (p. 70)

23. Flagellum of antenna 1 longer than peduncle. In male, pereonites I and II not greatly elongated; antenna 1 peduncle slender, not setose ..... *Metacaprella anomala* (p. 29)

    Flagellum of antenna 1 shorter than peduncle. In male, pereonites I and II much elongated; antenna 1 peduncle stout, densely setose ..... *Metacaprella kennerlyi* (p. 31)

Antenna 2 without swimming setae, flagellum bi- or tri-articulate; mandibular palp triarticulate, with three terminal bristles; molar absent; maxilliped lobes very small, outer larger than inner; gills on pereonites II, III, and IV; pereopods 3 and 4 one-segmented, pereopod 5 six-segmented; abdomen five-segmented, male with two pairs of well-developed biarticulate limbs on segments 4 and 5, plus two pairs of very rudimentary limbs on segments 1 and 2; female with two pairs of biarticulate limbs on abdominal segments 4 and 5.

Cercops compactus n. sp. (Figure 1)

Material examined:

Female holotype, NMC 10776, Puffin Bay, Baranof Island, latitude 56°16′N, longitude 134°40′W; intertidal. Station A171–172, 1961. Male allotype, NMC 11201, Middle Bay of Cape Arago, Oregon; intertidal, on *Plocamium pacificum*. July 8, 1960. 2 female paratypes, Middle Bay of Cape Arago, Oregon, July 8, 1960. 1 male paratype, Cape Blanco, Oregon, July 10, 1960.

Description:

Female: Head with small median dorsal projection behind eye, concave over eye, and with small median spine above antenna 1 attachment. Body without spines. Length 3.8 mm. Cephalon and pereonite II subequal, pereonites III and IV slightly longer, pereonite V equal to cephalon, pereonites VI and VII decreasing in size.

Eye with very few facets.

Antenna 1 equal in length to cephalon plus pereonite II, flagellum with five articles. Antenna 2 approximately equal to peduncle of antenna 1; flagellum triarticulate.

Mandible with triarticulate palp, having two bristles on median article, and two long bristles plus one shorter one on distal article; right incisor five-toothed, lacinia mobilis five-toothed, setal row of four long, slender plus five short, stout plumose setae. Maxilla I outer lobe with six serrate spines; palp with few heavy setae. Maxilla II lobes small and slender. Maxilliped inner lobe minute, convex distally, with two apical setae; outer lobe small, with several marginal and surface setae, median margin not serrate; dactylus of palp heavy. Upper and lower lip not known.

Propodus of gnathopod 1 almost square, with palmar surface beginning approximately halfway along ventral surface; palmar surface serrate, armed with one pair of proximal grasping spines, and with spines and setae; dactylus heavy. Propodus of gnathopod 2 almost circular, shorter than basis, with large proximal protrusion carrying a large spine, and small distal protrusion; palmar surface with spines and setae. Dactylus thickened proximally and tapering distally. Basis has a small lateral projection distally and is attached anteriorly on pereonite II; ischium square, slightly produced anteriorly, and with a small lateral projection; merus square, and smaller than ischium; carpus very small, rectangular.

Gills small, oval, the posterior one being the largest.

The brood plates have plumose setae around their margins, the anterior plate being the more setose.

Pereopods 3 and 4 are alike, being very small, one-segmented, with two setae distally, and are attached at the base of the gills. Pereopods 5, 6, and 7 are six-segmented, increasing in size posteriorly; propodus with up to three pairs of grasping spines on a proximal projection, palmar surface concave, with spines and setae; dactylus heavy, tapered distally.

The abdomen is approximately one-tenth of the length of the body, five-segmented, with two pairs of biarticulate limbs with a single longitudinal row of comb setae on each article. The proximal article has a distal spine-like projection which also carries comb setae.

Male: Very like female in general body proportions. Length of largest male 3.8 mm.

Mouthparts as in female; left mandible with five-toothed incisor, five-toothed lacinia mobilis, one accessory plate, and setal row of seven or eight setae. Gnathopod 2 basis very heavy; palmar surface of propodus setose, and having distal projections more obvious than in female. Abdomen with very rudimentary pleopods on segments 1 and 2; these consist of a minute unsegmented appendage terminating in a long seta. The biarticulate uropods on segments 4 and 5 are similar to those of the female, except for the anteriorly projecting basal knob on the uropod 1 of the male; this knob is possibly a copulatory organ. Penes lateral.

Variation

Both female paratypes had only two articles to the flagellum of antenna 2.

Remarks

The manuscript description of the single female type specimen had been completed when four more specimens of this species were received from Dr. Marvin P. Jessen. The male allotype was selected from this material and has been deposited in National Museums of Canada collections. The holotype, a mature female with three larvae in the brood pouch, was dissected and mounted as well as its poor condition would allow. The specific name refers to the very solid appearance of this specimen. Unfortunately, the other specimens had been whole mounted, and it was considered inadvisable to try to remove them from the slides. The species description has therefore been based on all five available specimens.

Distribution

Type locality: Puffin Bay, Baranof Island, Alaska.
Other localities: Cape Arago and Cape Blanco, Oregon.

Discussion

The only other species in this genus is *Cercops holbolli* Krøyer, which has been reported from S. Greenland and from Japan (Tsugaru Strait). The new species differs from this in the absence of body spines, in having a triarticulate flagellum in antenna 2, in the setation of the inner and outer lobes of the maxil-

liped, and in the much less slender conformation, with different form of palmar surface, of the appendages. Because of the segmentation of antenna 2 flagellum, it has been necessary to change the genus diagnosis.

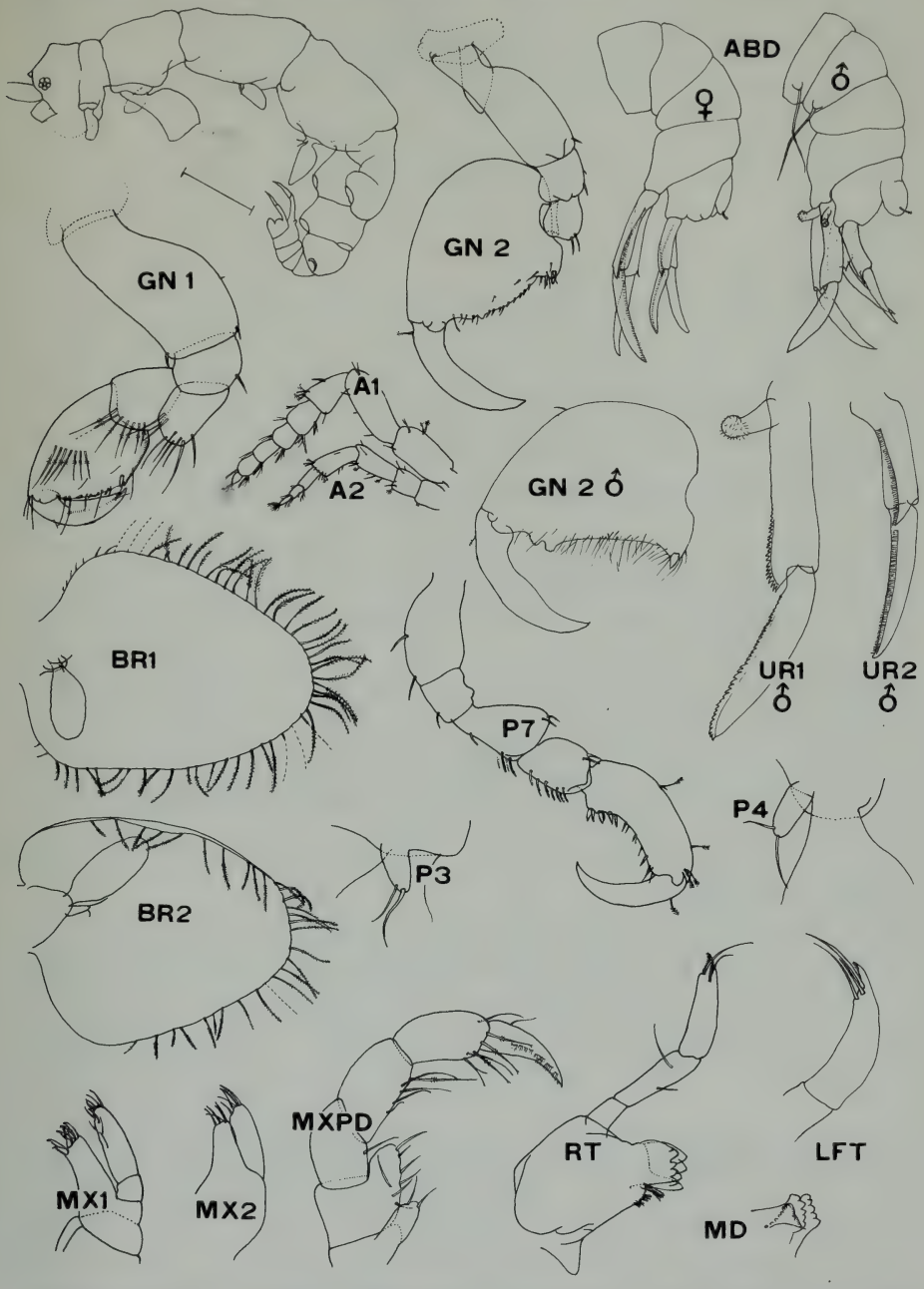


FIGURE 1 — *Cercops compactus*. Male allotype, lateral view; scale equals 0.5 mm. Female holotype, mouthparts and appendages. Male allotype and paratype, gnathopod 2 propodus, abdomen, uropods and left mandibular palp and incisor region.

97949—2½

Genus *PEROTRIPUS* Dougherty and Steinberg 1953

Antenna 2 without swimming setae, flagellum biarticulate; mandibular palp triarticulate with one terminal seta, molar absent; outer lobe of maxilliped equal to or larger than inner lobe, both minute; gills on pereonites II, III, and IV; pereopod 3 three-segmented, 4 one-segmented, 5 three-segmented; abdomen of male with one pair one-segmented appendages plus one pair setose lobes, of female with one pair of setose lobes.

Perotripus brevis (La Follette 1915) (Figures 2, 26, Map 1)

Synonymy

Paedaridium breve La Follette 1915

Perotripus brevis—Dougherty and Steinberg 1953; 1954

Material Examined

Prince William Sound: two males, stations A87, A92, 1961; NMC 10820, 10821.

Dall Island: two males, station A3, 1961; NMC 10819.

Queen Charlotte Islands: six males, ten females, station W11, 1967; NMC 10839.

Hecate Strait: over thirty males, over fifty females, stations H5, H25, H26, H29, H30, H33, 1964; NMC 10822–10827.

Queen Charlotte Sound: five males, six females, stations H50, H53, H58, 1964; NMC 10829–10831.

Vancouver Island: one male, one female, station H44, 1964; NMC 10828.

Description

Male: Body smooth, but pereonites II and III sculptured with lateral projections, as shown in Figure 2. Length 4.9 mm. Cephalon and pereonites II and III equal in length; IV is longer; V plus VI approximately equal to half the body length; VII and the abdomen are minute. The anterior pereonites are stout, the posterior one slender.

Antenna 1 shorter than cephalon plus pereonite II, stout, basal article distally produced to form a frill around base of second article; articles 2, 3, and flagellum sparsely setose; flagellum with two articles, the basal one being about as long as the third peduncular article. Antenna 2 slightly shorter than antenna 1 peduncle; articles 3 and 4 sparsely setose; flagellum minute with spindle-shaped first article.

Mandible with triarticulate palp, middle and terminal articles each with a single seta; left mandible with five-toothed incisor, five-toothed lacinia mobilis, one accessory plate, one seta; right mandible with five-toothed incisor, lacinia mobilis not denticulate, one accessory plate, one seta. Maxilla I with six serrate spines on outer lobe; palp with few stout setae. Maxilla II with very small slender lobes with few setae. Inner lobe of maxilliped convex distally, with two median setae and outer tooth-like projection; outer lobe with slightly serrate apical margin, and marginal setae; dactylus of palp heavy and barely tapered,

with serrate proximal and setose distal margin. Lower lip with very weakly developed inner lobes.

Propodus of gnathopod 1 triangular, ventral surface with proximal projection with serrate edge, bearing four grasping spines, palmar suface convex bearing spines and a few setae. Propodus of gnathopod 2 twice as long as it is broad, with proximal ventral projection bearing two pairs of grasping spines and a small proximal spine; palmar surface slightly convex and with spines; digit thickened proximally, tapered distally. Basis just shorter than propodus, attached anteriorly on pereonite II; ischium square, merus round, carpus triangular.

Gills very small, oval.

Pereopod 3 attached at base of gill; first segment with short distal seta, second segment very small with long seta, terminal segment long with subterminal seta and terminal plumose seta. Pereopod 4 attached at base of gill, with two terminal setae, one plain and one plumose. Pereopod 5 with first and second segments of same length, first segment with one large seta, second segment shaped rather like a propodus; third segment a short claw, bearing a large plumose seta. Pereopods 6 and 7 six-segmented, with segments 4 and 5 elongated and bearing spines on their anterior surface; propodus with no well-defined palmar surface; dactylus slender.

Abdomen with lateral penes; one pair of unsegmented appendages terminating in a long bristle, and one pair of lobes with two to four bristles.

Female: Length 4.8 mm. In general the female is similar to the male. Pereonites III and IV are very much more swollen laterally and dorsoventrally; the anterior brood plate has plain setae all round its margin; the posterior brood plate has plain setae on the posterior margin only. The abdomen has one pair of lobes with one or two bristles.

Remarks

This species when present in a preserved collection can easily be detected because of the characteristic bent shape of its body (*see* Figure 2). La Follette records the color as "light pink to white."

Distribution

Type locality: Laguna Beach, California.

Other localities: San Juan area, Washington.

New records: Pacific coasts of Alexander Archipelago, Alaska, and Vancouver Island, B.C.; southern Prince William Sound, Alaska; British Columbia mainland coast from Banks Island to Rivers Inlet.

Discussion

Although this species differs from La Follette's type description in having three pairs of gills, there is little doubt that it is the same animal as his *Paedaridium breve*. In all other characters mentioned by him there is no difference,

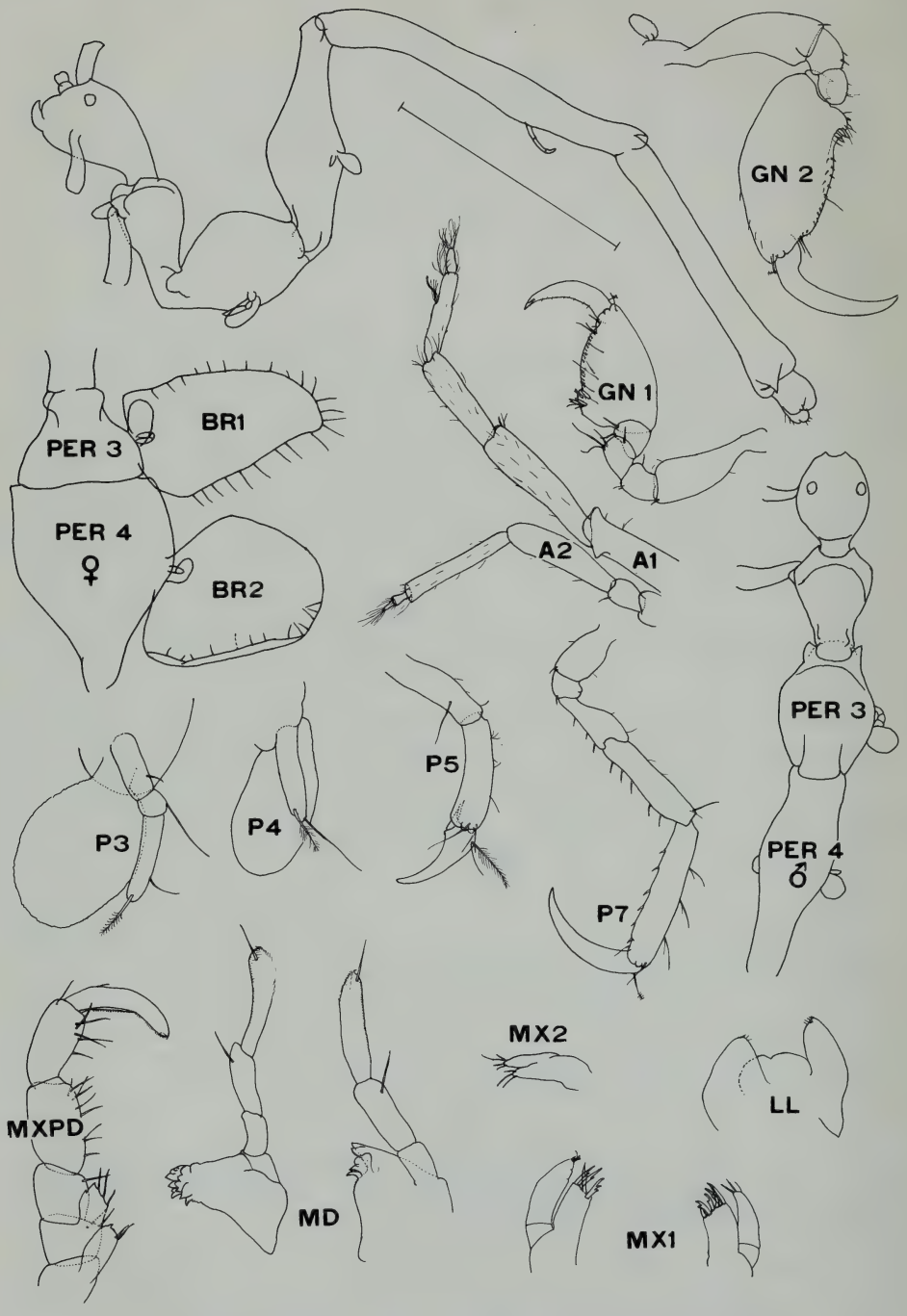
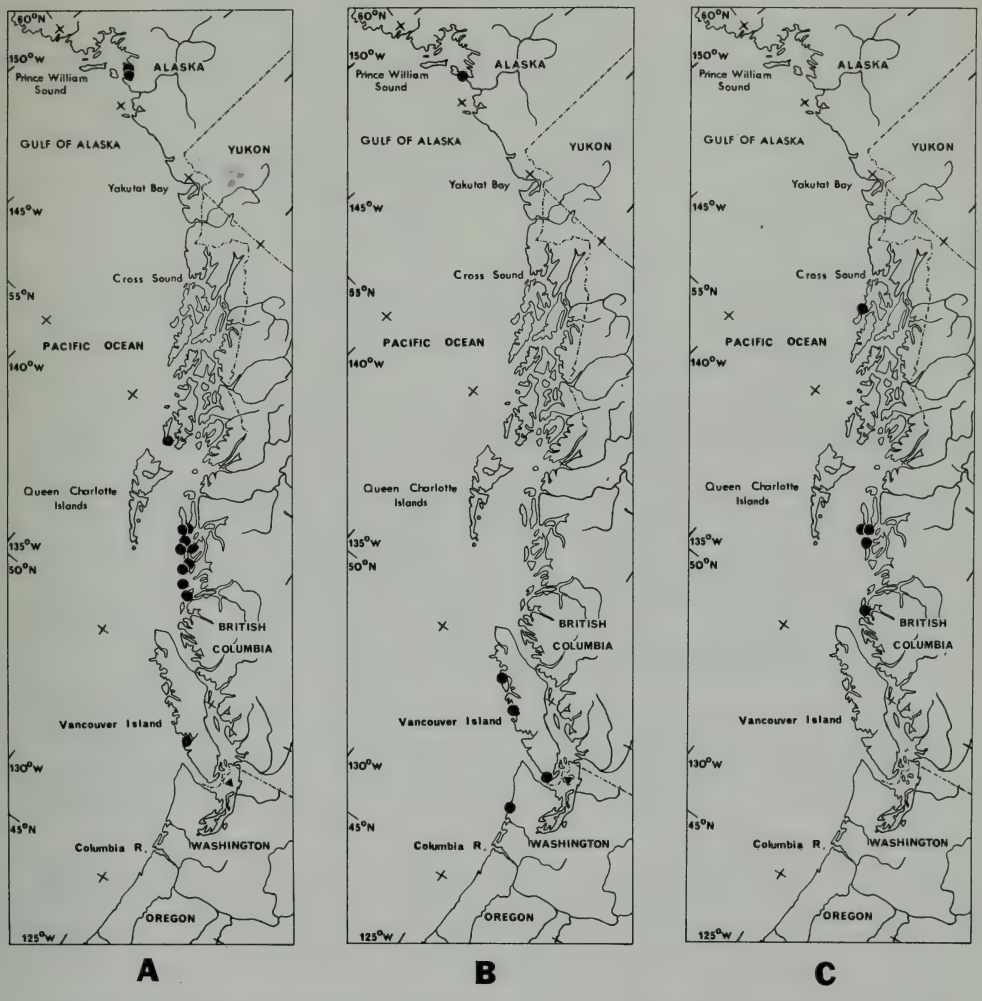


FIGURE 2 — *Perotripus brevis*. Male, lateral view and appendages. Dorsal view of anterior pereonites of male, and of pereonites III and IV of female, drawn to scale.

except those which would be expected between his, presumably, juvenile specimens and the more mature specimen described above. As the gills are very small, the first pair, which is normally between the bases of the second gnathopods, could easily be overlooked.

In his description, La Follette did not give his reasons for assigning this species to genus *Paedaridium*. According to Mayer's diagnostic characters, this species does not belong in genus *Paedaridium*, and on the basis of the segmentation of pereopods 3 to 5 it was rightly given new generic status by Dougherty and Steinberg (1953). However, on the basis of such characters as were used by Mayer and of our limited knowledge of the mouthparts of the various genera, *Perotripus* appears to be at least as close to *Paedaridium* as it is to the six genera listed by Dougherty and Steinberg.



Map fig. 1 — Known distribution of (a) *Perotripus brevis*, (b) *Deutella californica*, and (c) *Mayerella banksia* within the American Pacific boreal region.

Genus *DEUTELLA* Mayer 1890

Antenna 2 without swimming setae, flagellum biarticulate; mandibular palp triarticulate, setal formula for terminal article $1 + x + 1$; molar present; outer lobe of maxilliped larger than inner lobe; gills on pereonites III and IV; pereopods 3 and 4 two-segmented, pereopod 5 six-segmented, inserted at posterior end of pereonite V; abdomen of male with one pair of non-segmented appendages and one pair of setose lobes, of female with one pair setose lobes.

Deutella californica Mayer 1890 (Figures 3, 26, Map 1)

Synonymy

Deutella californica Mayer 1890; 1903 — Dougherty and Steinberg 1953; 1954 — Steinberg and Dougherty 1957 — Gardella 1962 — McCain 1968

Material Examined

Vancouver Island: two males, two females, stations 07b, 1959, NAP66-201; NMC 10777, 10781; USNM 172360.

Washington Coast: one male, station W22, 1966; NMC 10779.

Oregon Coast: over thirty individuals, station W63, 1966; NMC 10780.

Prince William Sound: one male, station A153, 1961; NMC 10778.

Description

Male: Head bears a small anteriorly pointing median spine; pereonite II with antero-lateral anteriorly pointing projections; other body tuberculations minute or absent. Length 5.5 mm.

Antenna 1 equals approximately half the body length, flagellum with up to twelve articles. Antenna 2 shorter than antenna 1 peduncular articles 1 plus 2.

Mandible with triarticulate palp, with one seta on penultimate article, and setal formula $1 + x + 1$ for the terminal article; left and right mandible with incisor five-toothed, lacinia mobilis five-toothed, setal row of three plumose setae. Maxilla I outer lobe with six serrate spines, palp with few setae. Maxilliped inner lobe flat distally, with few apical setae; outer lobe with one apical and few marginal and surface setae, median margin not serrate; palp with distal projection on subterminal article, heavy dactylus with apical seta.

Propodus of gnathopod 2 nearly rectangular; palmar surface with proximal grasping spine, and median poison spine separated from the distal portion by a deep cleft; proximal margin finely denticulate, distal margin coarsely denticulate; palmar and distal portion of propodus bear long hairs. Basis attached anteriorly on pereonite II.

Pereopods 3 and 4 small, similar, with a ring of setae at the distal end of the first segment, second segment minute with three terminal bristles. Pereopods 5, 6, and 7 six-segmented; propodus with concave palmar surface, having a proximal series of knobs bearing grasping spines.

Abdomen with lateral penes; one pair of one-segmented appendages armed distally with small teeth, and one pair of setose lobes.

Female: Length 3.8 mm. Differs from male in having a small median knob on head; second gnathopod propodus palmar surface without cleft or large poison spine and with short hairs; anterior brood plate with plumose setae around margin, posterior plate with plumose setae on posterior margin only. Abdomen with one pair setose lobes.

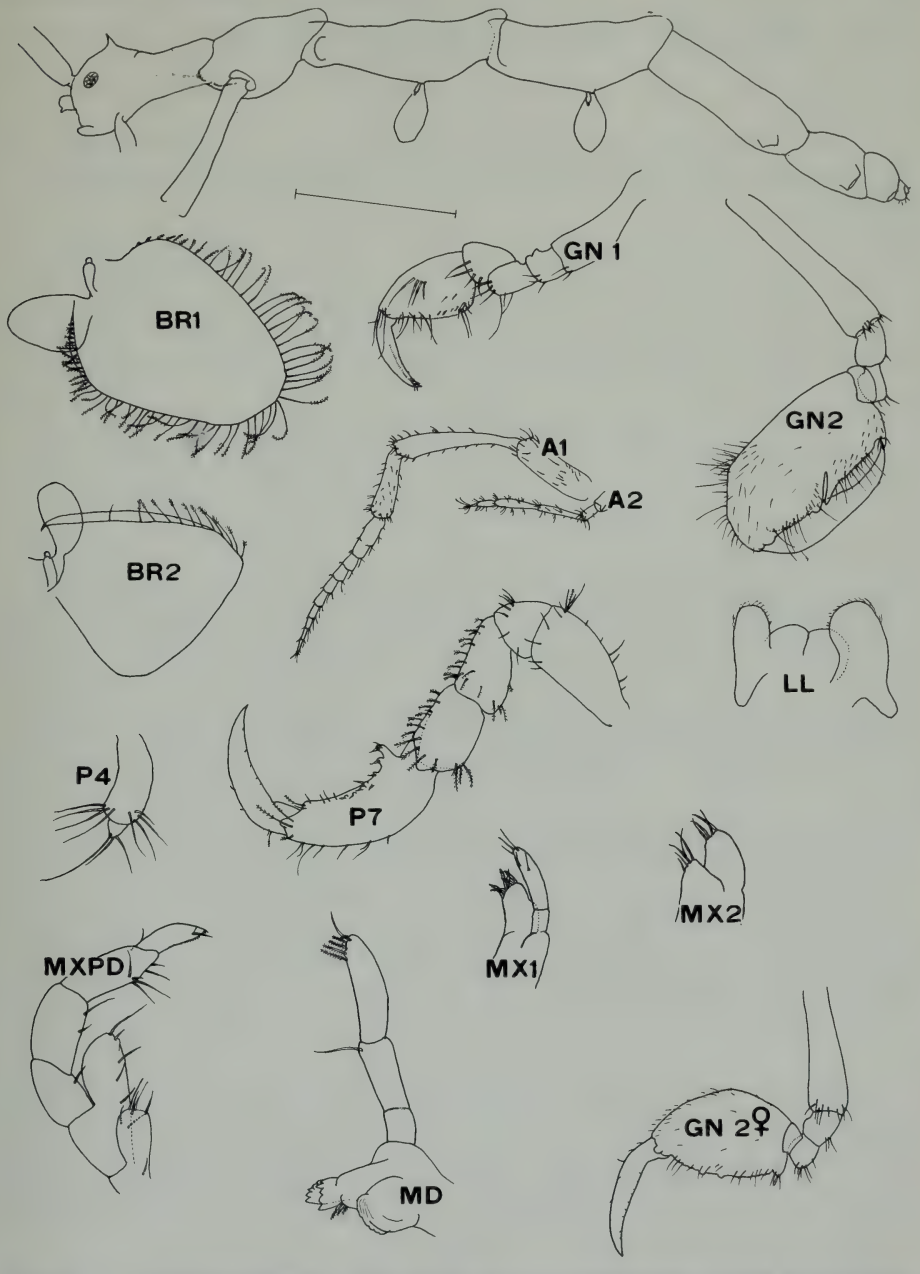


FIGURE 3 — *Deutella californica.* Male, lateral view and appendages. Female brood plates and gnathopod 2.

Distribution

Type locality: Cape Mendocino, California.

Other localities: Monterey Bay and Mussel Point, California; "probably Port Aransas, Texas" (Steinberg and Dougherty 1957); San Juan area, Washington.

New records: Pacific coasts of Oregon, Washington, and Vancouver Island; Juan de Fuca Strait, B.C.; southern Prince William Sound, Alaska.

Discussion

As has been pointed out by McCain (1968), the Texas locality record for this species is very doubtful; it is probable that *Deutella californica* is endemic to the Pacific.

Antenna 2 without swimming setae, flagellum biarticulate; mandibular palp triarticulate with one seta on terminal article; molar present; outer lobe of maxilliped larger than inner lobe; gills on pereonites III and IV; pereopods 3 and 4 two-segmented, pereopod 5 three-segmented; abdomen of male with one pair of appendages and one pair of lobes, of female with one pair of lobes.

Mayerella banksia n. sp. (Figures 4, 26, Map 1)

Material Examined

Male holotype, NMC 10832, Rennison Island, B.C., 4–12 fm, station H30, 1964.

Female allotype, NMC 10833, Cox Point Inlet, Trutch Island, B.C., station H26, 1964.

Forty male paratypes, twelve female paratypes, NMC 10834–10836, Hecate Strait, B.C., stations H25, H26, H30, 1964.

One male, one female, NMC 10837, Queen Charlotte Sound, B.C., station H37, 1964.

One male, NMC 10838, Chicagof Island, Alaska, station A165, 1961.

Three females, Department of Fish and Game, California, latitude 122° 24′ N, longitude 37° 5′ W.

Description

Male: Body smooth except for small antero-lateral projections on pereonites II and III. Length 5.9 mm. Cephalon and pereonite II subequal, longer than III which equals IV; pereonite V is the longest, VI shorter, VII minute; the abdomen protrudes ventrally.

Antenna 1 shorter than cephalon plus pereonite II, flagellum with five articles, peduncular articles 2 and 3 with sparse setae; antenna 2 equal in length to peduncle of antenna 1, flagellum very small.

Mandible with triarticulate palp with one seta on median article, and one apical seta on terminal article; incisor five-toothed, lacinia mobilis five-toothed on left and indistinctly toothed on right, setal row three on left and two on right. Maxilla I outer lobe with seven serrate spines, palp with three spines plus setae. Maxilla II lobes with few setae. Inner lobe of maxilliped flat distally, with few plumose setae and one tooth; outer lobe with one plumose and one plain apical seta, median margin strongly denticulate, few surface setae; palp with finely tapered dactylus.

Propodus of gnathopod 1 slender and triangular, palm with one pair proximal grasping spines, margin serrate and armed with spines and plumose setae; 'comb setae' present midway between dorsal and ventral margins. Dactylus stout, inner margin scalloped and minutely serrate. Propodus of gnathopod 2 more than three times as long as broad; palm with proximal protrusion bearing a grasping spine, distal poison spine separated by cleft from rectangular projection in the angle of the dactylus; margin of palm finely serrate and with a few setae. Dactylus heavy, distal third strongly curved inwards. Basis attached

posteriorly on pereonite II; longer than propodus, and with slight antero-lateral projection distally. Ischium and merus approximately equal, carpus very small and triangular.

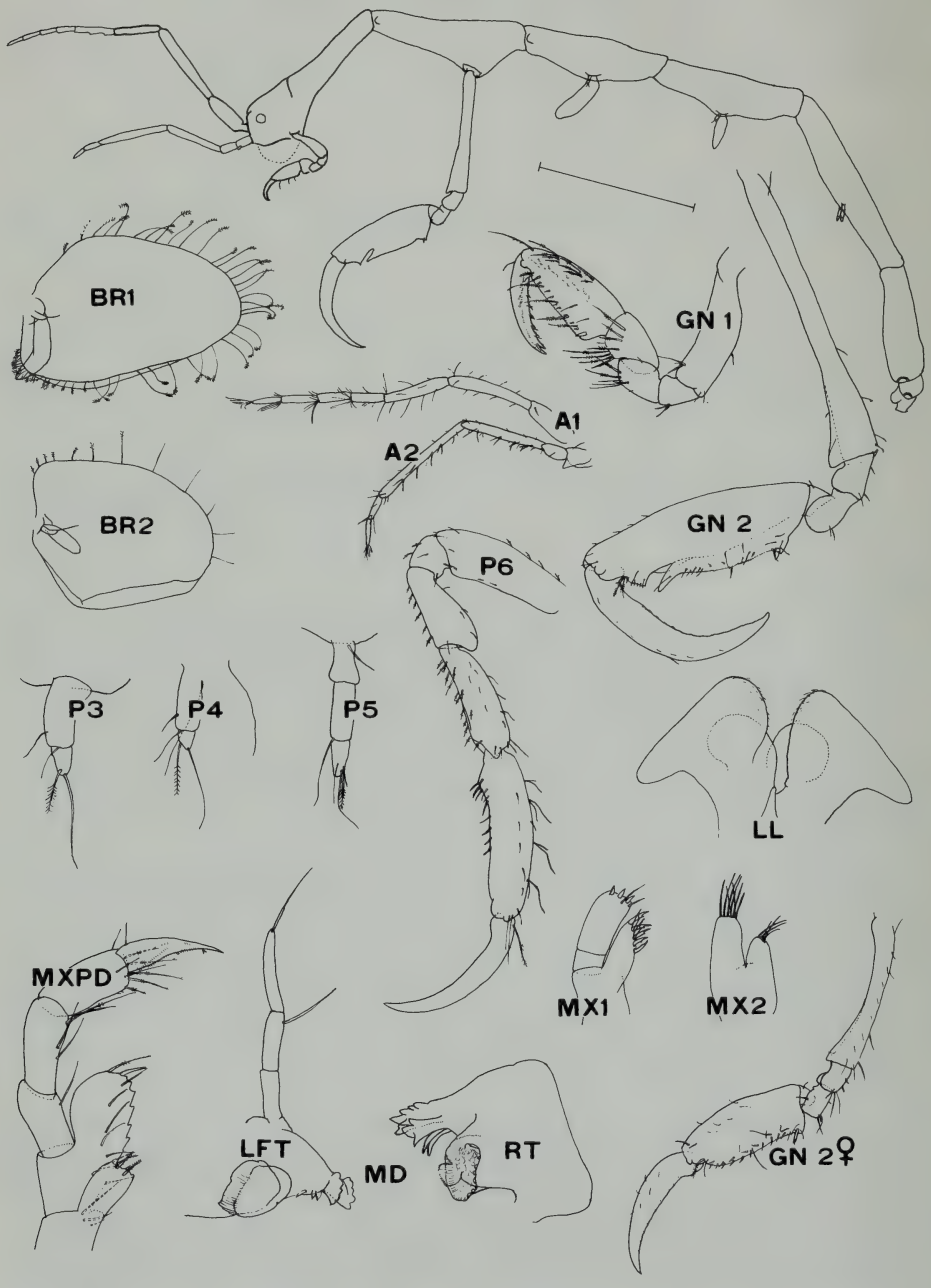


FIGURE 4 — *Mayerella banksia.* Male holotype, lateral view. Male paratype, appendages. Female paratype, brood plates and gnathopod 2.

Gills small and oval, the posterior ones being smaller.

Pereopods 3 and 4 small, attached to base of gills; first segment with two setae, terminal segment with one plumose and one plain seta. Pereopod 5 with one seta at base of proximal segment, distal seta on second segment, terminal segment with three plain and one plumose setae. Pereopods 6 and 7 six-segmented; palmar region of propodus only slightly developed; most of anterior margin of pereopod armed with spines.

Abdomen with one pair of uniarticulate limbs, separated by median chitinous hump bearing very small teeth posteriorly; one pair of setose lobes, not distinctly separated.

Female: Length 3.9 mm. Differs from male in that anterior segments do not elongate with maturity, and pereonites III and IV are swollen. Gnathopod 2 arises anteriorly on pereonite II, and its propodus lacks both poison spine and palmar cleft and is armed with a proximal grasping spine and many palmar spines; margin of palm serrate. Anterior brood plate has plumose setae around the margin, posterior plate has setae on posterior margin only. Abdomen with one pair of lobes with setae.

Distribution

Type locality: Rennison Island, B.C.

Other localities: Rennison Island, Rivers Inlet, and Trutch Island, B.C.; Chichagof Island, Alaska; south of Golden Gate, California.

Discussion

This is the first species of this genus to be reported from the Pacific and is named after Banks Island, one of the larger islands in the type region. *M. limicola* Huntsman and *M. redunca* McCain both occur in the northwest Atlantic and differ from *M. banksia* in the structure of both gnathopods, and of pereopods 6 and 7. The most striking differences are in the abdomen: in *M. limicola* the penes are medial, and in *M. redunca* the appendages are long, slender, and recurved at the tip; neither species appears to have the median chitinous hump found in *M. banksia*. *Mayerella* is probably Mayer's genus *Incertum* (1903) from California. The only real difference between these genera is the absence of the mandibular palp in Mayer's single specimen. However, the mandibular palp is frequently not observable in *Mayerella* unless the mandible is dissected; the palp is either held very close to the head or is easily lost.

Genus *TRITELLA* Mayer 1890

Antenna 2 with swimming setae, flagellum biarticulate; mandibular palp triarticulate, setal formula for terminal article 1 + x + 1; molar present; outer lobe of maxilliped larger than inner lobe; gills on pereonites III and IV; pereopods 3 and 4 one-segmented, pereopod 5 six-segmented; abdomen of male and female with 1 pair of setose lobes.

Tritella laevis Mayer 1903 (Figures 5, 26, Map 2)

Synonymy

Tritella laevis Mayer 1903 — Dougherty and Steinberg 1953; 1954 — McCain 1968.

Material Examined

Queen Charlotte Islands: fifteen males, six females, stations H2a, W8, W11, W12, 1957; NMC 10784–10787.

Queen Charlotte Sound: eight males, eleven females, stations H1, H50, H53, 1964; NMC 10793, 10795, 10796.

Vancouver Island: eight males, nine females, stations F1, P7, 1955; N6, O1, O7b, O11, V4b, 1959; H44, 1964; NMC 10782, 10783, 10788–10792, 10794; two males, two females, NMC 10801; one female, USNM No. 172360.

Juan de Fuca Strait: two males, stations W34, W42, 1966; NMC 10797, 10798.

Oregon Coast: five males, seven females, stations W57, W60, 1966; NMC 10799, 10800.

Description

Male: Body smooth dorsally, anteriorly directed anterolateral spines on pereonites II, III, and IV; no spines over gills. Length 9.4 mm. Cephalon shorter than pereonite II, pereonite III is the longest, IV and V approximately equal, VI plus VII shorter than V.

Antenna 1 longer than cephalon plus pereonite II, flagellum with eleven articles. Antenna 2 just longer than peduncle of antenna 1, flagellum two-thirds previous article, stout and with heavy setae.

Left mandible with five-toothed incisor, lacinia mobilis five-toothed, three setae; right mandible with toothed lacinia mobilis and two setae. Maxilla I outer lobe with seven serrate spines. Maxilliped inner lobe distally flat with plumose setae and one tooth; outer lobe with one or two apical plumose setae, one tooth and denticulate median margin; palp with distal projection on subterminal article, dactyl heavy, with apical seta.

Propodus of gnathopod 2 curved, twice as long as broad, palm concave and densely setose, with proximal grasping spine and poison spine. Dactylus with proximal and distal thickenings, tapering abruptly distally, densely setose inner edge. Basis attached anteriorly on pereonite II.

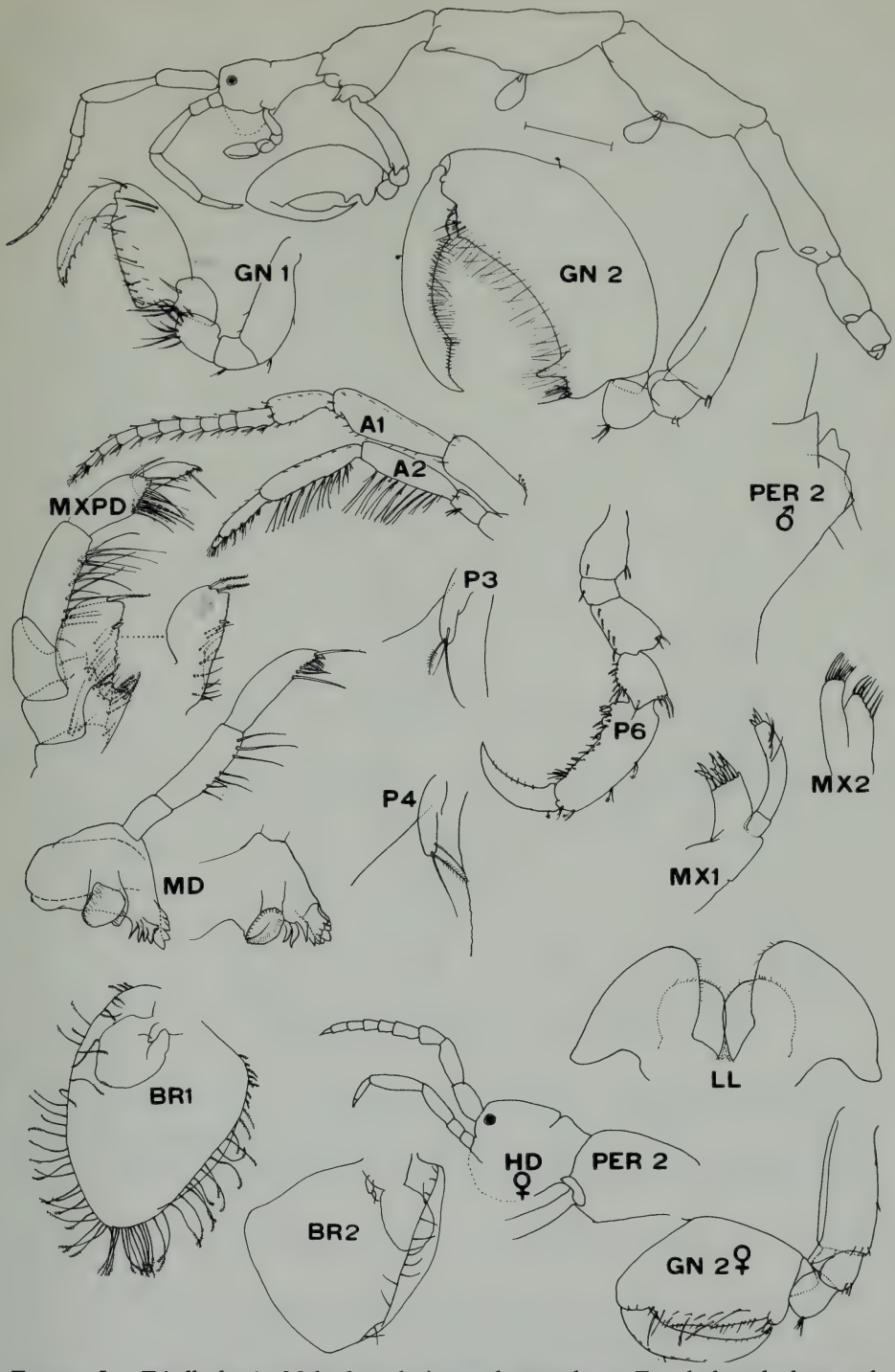
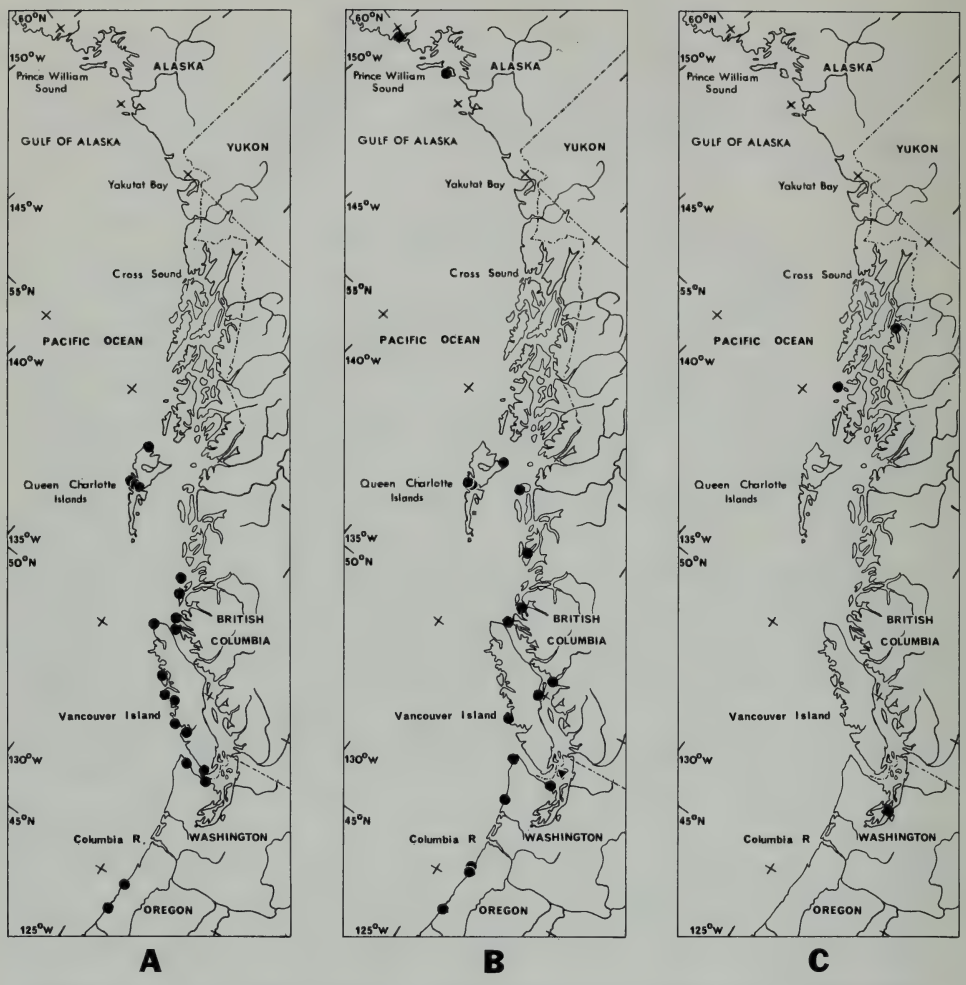


FIGURE 5 — *Tritella laevis*. Male, lateral view and appendages. Female brood plates and gnathopod 2. Dorsal view of male pereonite II, showing orientation of lateral spines, and lateral view of anterior pereonites of female, not to scale.



Map fig. 2 — Known distribution of (a) *Tritella laevis*, (b) *T. pilimana*, and (c) *Metacaprella anomala* within the American Pacific boreal region.

Pereopods 3 and 4 similar, having three apical setae, one of which is plumose. Pereopods 5, 6, and 7 normal, propodus thickened proximally with palmar knobs supporting the grasping spines, the knobs being most developed on pereopod 7.

Abdomen with lateral penes, and one pair of lobes with three setal clumps on each.

Female: Length 6.2 mm. Differs from male in showing no lengthening of pereonite I with maturity; gnathopod 2 has heavier propodus, median and minute poison spine, few hairs on palm or dactylus. The anterior brood plate has plumose setae around the margin, the posterior plate has setae on the posterior margin only. Abdomen has one pair of setose lobes.

Remarks

The fifty-seven specimens of this species in the NMC collections were examined in greater detail individually than were many other species, and among them were found two 'female' intersexes. One (station H53/64) has the male gnathopod 2 and abdomen with penes, and the female brood plates and some evidence of a female genital opening on pereonite V. The other (station W60/66) has the male gnathopod 2 and abdomen with penes, and developing brood plates but no sign of the female opening on pereonite V. There is no evidence of intersexes among the specimens of *T. pilimana* examined. Apart from Mayer's (1903) record of two "Hermaphrodite" specimens of *Caprella bispinosa*, no reference to caprellid intersexes has been found in the literature.

Mayer's description of *T. laevis* distinguishes this species from *T. pilimana* on the basis that *T. pilimana* has body spines and *T. laevis* does not. It is probable that the specimens described by Mayer were subadult or immature males, in which the body spines are either absent or very small; in the adult they are noticeable, particularly on pereonite II (*see* Figure 5).

Freshly preserved specimens showed two color variations, one having a reddish-brown body with non-pigmented areas, the pereopods being paler and striped with dark pigment bands; the other being translucent with pink coloration developed dorsally on the body and antennae.

Distribution

Type locality: Santa Catalina, California.

Other localities: Pacific Grove, Dillon Beach, Moss Beach, and Monterey Bay, California.

New records: Pacific coasts of Oregon, Vancouver Island, and Queen Charlotte Islands; Washington and B.C. coasts of Juan de Fuca Strait; mainland coast of Queen Charlotte Sound, and Queen Charlotte Strait, B.C.

Tritella pilimana Mayer 1890 (Figure 6, Map 2)

Synonymy

Tritella pilimana Mayer 1890; 1903 — Dougherty and Steinberg 1953; 1954 — McCain 1968

Aeginella hirsuta La Follette 1915

Material Examined

Prince William Sound: one male, one female, stations A80, A133, 1961; NMC 10808, 10809.

Queen Charlotte Islands: seven males, one female, stations H14, W9, W11, 1957; NMC 10804–10806.

Hecate Strait: four males, one female, stations H8, H31, 1964; NMC 10810, 10811.

Queen Charlotte Sound: ten males, three females, station H37, 1964; NMC 10812.

Vancouver Island: sixteen males, eleven females, stations G2, P6c, 1955; V3, 1959; NMC 10802, 10803, 10807; USNM 148064.

Juan de Fuca Strait: two males, station W44, 1966; NMC 10815.

Washington Coast: seven males, twelve females, stations W22, W40, 1966; NMC 10813, 10814.

Oregon Coast: eighteen males, eighteen females, stations W57, W63, W66, 1966; NMC 10816–10818.

Description

Male: Body smooth dorsally, but with laterally pointing spines anterolaterally on pereonites II, III, and IV, and medially over gills. Length 11 mm. Cephalon equals pereonite II, pereonite III equal to IV, but longer than II, V shorter than IV and longer than VI plus VII.

Antenna 1 nearly as long as cephalon plus pereonites II and III, flagellum with twelve articles. Antenna 2 shorter than peduncle of antenna 1, flagellum six-sevenths of preceding article, slender with long swimming setae.

Left mandible with five-toothed incisor, five-toothed lacinia mobilis, and three setae; right mandible with denticulate but not five-toothed lacinia mobilis, and two setae. Maxilla I outer lobe with seven serrate spines. Maxilliped inner lobe flat distally, with plumose setae and one tooth; outer lobe concave apically, with one apical plumose seta, median margin serrate, and few marginal and surface setae.

Propodus of gnathopod 2 twice as long as it is broad, palm slightly concave, densely setose with proximal grasping spine and poison spine. Dactylus with distal and slight proximal thickening, gently tapering distally, and densely setose along inner margin. Basis attached anteriorly on pereonite II.

Pereopods 3 and 4 as in *T. laevis*; pereopods 5, 6, and 7 six-segmented, propodus with proximal grasping spines; palmar knobs supporting grasping spines may be present on pereopod 7.

Abdomen as in *T. laevis*.

Female: Length 7.9 mm. Differs from male in showing no lengthening of pereonite I with maturity; the gnathopod 2 propodus is heavier, with median minute poison spine and very few hairs on palm. Brood plates and abdomen as in *T. laevis*.

Remarks

Freshly preserved specimens show two different color types; one is translucent with aggregations of dark pigment spots giving the appearance of blotches and stripes over all the body except the pereopods; the other is translucent pink with isolated pigment blotches along the dorsal surface only.

It is probable that this species is the same animal as *Aeginella hirsuta* La Follette 1915, to whose description it appears to bear a greater resemblance than does *T. laevis*.

Distribution

Type locality: Mendocino, California.

Other localities: Humboldt Bay, Laguna Beach, Dillon Beach, and Moss Beach, California; San Juan area, Washington.

New records: Pacific coasts of Oregon, Vancouver Island, and Queen Charlotte Islands; Washington coast of Juan de Fuca Strait; southern Prince

William Sound, Alaska; Dixon Entrance, and mainland coast south to Johnstone Passage, B.C.

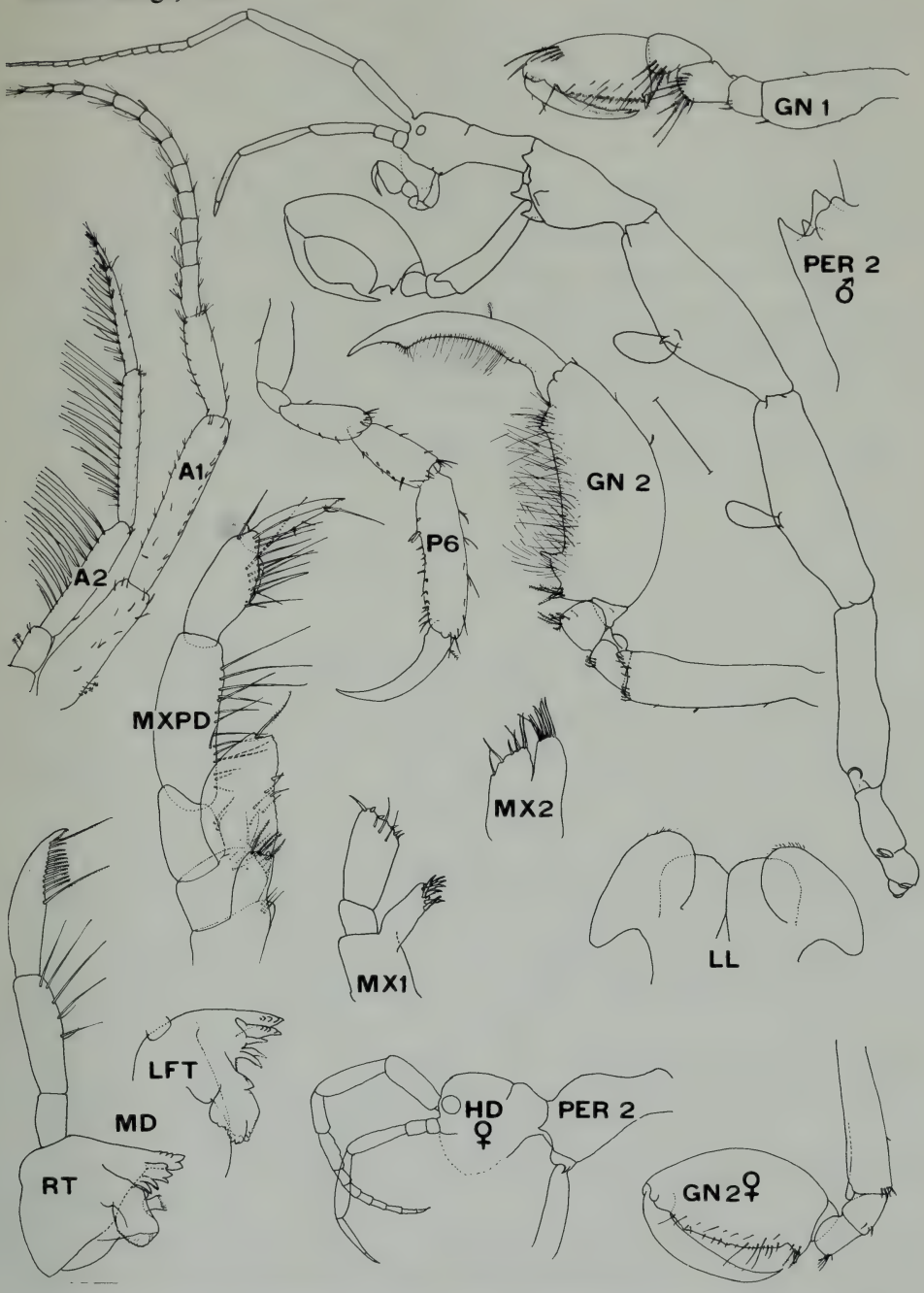


FIGURE 6 — *Tritella pilimana*. Male, lateral view and appendages. Female gnathopod 2. Dorsal view of male pereonite II, showing orientation of lateral spines, and lateral view of anterior pereonites of female, not to scale.

97949—3½

Discussion

The two *Tritella* species described here are very similar and are hard to distinguish. The appendages, e.g., antennae and pereopods, of *T. pilimana* appear to be slightly slimmer than those of *T. laevis*; the most noticeable points of distinction are the flagellum of antenna 2 and the lateral body spines, which point anteriorly in *T. laevis* and laterally in *T. pilimana*; also, in fresh specimens, the color differences are noticeable.

No specimens of Mayer's *Tritella* sp. have been found. The specimen in the USNM was examined and appears to differ from *T. pilimana* only in the spination of pereonite II and in the fact that the claw of gnathopod 2 is not setose.

One specimen of a *Tritella* sp. was found, which bears a strong resemblance to *T. pilimana* except that it has a long, slender head spine; as the specimen is in poor condition and is noticeably parasitised, it was decided not to call it a new species until adequate specimens are collected.

Mayer (1903) indicates that in *Tritella* the females have no abdominal appendages. There are, however, obvious setose lobes on the female abdomen (*see* Figure 26 (2.)), and the genus diagnosis has been altered accordingly.

Genus *METACAPRELLA* Mayer 1903

Antenna 2 with swimming setae, flagellum biarticulate, mandibular palp absent; molar present; outer lobe of maxilliped larger than inner lobe; gills on pereonites III and IV; pereopods 3 and 4 absent; pereopod 5 six-segmented; abdomen of male with one pair of appendages and one pair of lobes, of female with one pair of appendages.

This genus was provisionally established by Mayer (1903) and subsequently adopted by Dougherty and Steinberg (1953). Although no differences between the species in this genus and genus *Caprella* have been observed, except for the character of the female abdomen, it has been decided to allow this genus to stand because it conforms to Mayer's original standards of generic distinction.

At the time genus *Metacaprella* was adopted, it was decided to include *C. ferrea* on the basis of its resemblance to *M. anomala* and *M. kennerlyi*; however, there is no sign of rudimentary limbs on the abdomen of the female of this species, and it has accordingly been restored to *Caprella*.

Metacaprella anomala (Mayer 1903) (Figures 7, 26, Map 2)

Synonymy

Caprella anomala Mayer 1903 — Arimoto 1934
Metacaprella anomala — Dougherty and Steinberg 1953; 1954

Material Examined

Southern Alaska: six males, nine females, stations JWS 85, 1965, A173, 1961; NMC 11003, 11004; USNM acc. 85557.

Puget Sound: two males, two females, station W8, 1966; NMC 11005.

Pacific Grove: two individuals from the Zoologische Staatssammlung, Munich.

Description

Male: Head with one pair anteriorly pointing spines, pereonites I to IV smooth dorsally except for an unpaired spine posteriorly on IV; V has three pairs of spines, VI and VII two pairs each; lateral spines may be present over the bases of the second gnathopods, antero-laterally on pereonites III and IV, and over the gills. No mature male was found; largest specimen was 9.9 mm (Mayer's largest male specimen was 13 mm).

Antenna 1 longer than cephalon plus pereonites II, III, and IV, flagellum longer than peduncle and having at least twenty-one articles. Antenna 2 equals peduncle of antenna 1; flagellum has long swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible toothed, but not five-toothed.

Gnathopod 1 propodus and dactylus with serrate grasping margin. Gnathopod 2 propodus less than half as broad as it is long, palm with proximal grasping spine and accessory spine, distal poison spine and more distal triangular projection. Dactylus evenly tapered. Basis attached just posterior to the middle of pereonite II, and with antero-lateral ridge.

Gills oval.

Pereopods 5, 6, and 7 with proximal grasping spines on propodus.

Abdomen typical of genus.

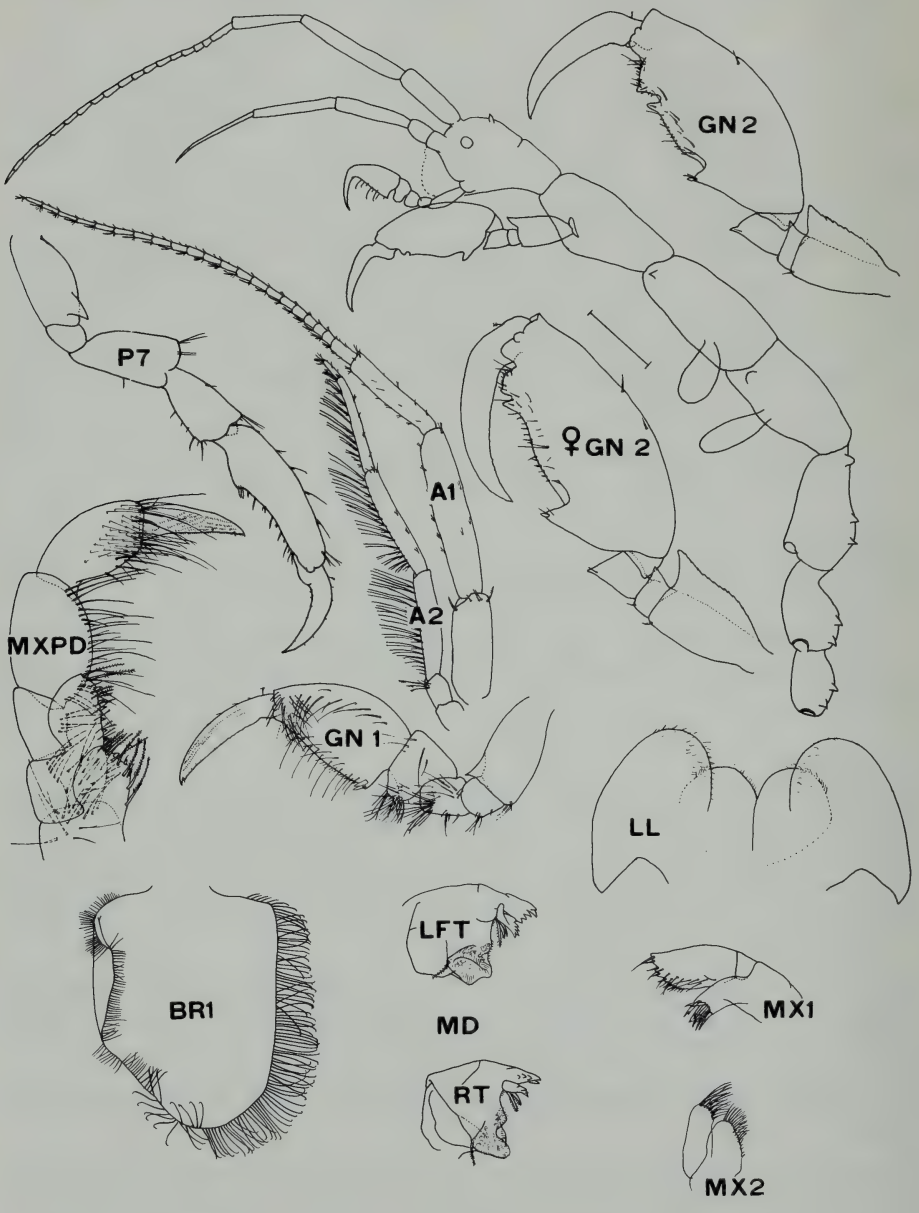


FIGURE 7 — *Metacaprella anomala.* Subadult male, lateral view and appendages. Female gnathopod 2 and anterior brood plate.

Female: Length 13.2 mm. Differs from male in showing no elongation of pereonite I; antenna 1 flagellum with twenty-three articles; some spines present on anterior body segments. Abdomen typical of genus.

Distribution

Type locality: Pacific Grove, California.

Other localities: Japan; Moss Beach and Monterey Bay, California.

New records: Alexander Archipelago and off Sumdum Glacier, Alaska; Puget Sound, Washington.

Discussion

Knowledge of the distribution of *M. anomala* is limited, but the species appears to be highly eurytopic. It has been found intertidally and down to 50+ fm and at temperatures ranging from 14.8°C to 6.3°C. From knowledge of its range along the North American coast and in Japan, it is suggested that this may be an amphi-pacific species.

Metacaprella kennerlyi (Stimpson 1864) (Figure 8, Map 3)

Synonymy

Caprella kennerlyi Stimpson 1864 — Mayer 1882; 1903 — Holmes 1904 — Johnson and Snook 1927 — Wailes 1931 — Light 1941 — Ricketts and Calvin 1952

Metacaprella kennerlyi — Dougherty and Steinberg 1953; 1954 — Gardella 1962 — Saunders 1966

Material Examined

Oregon, Washington, Puget Sound, San Juan Islands, Juan de Fuca Strait, Strait of Georgia, Vancouver Island, Queen Charlotte Sound, Queen Charlotte Islands, Southern Alaska, and Prince William Sound: thirty-two lots comprising over two hundred individuals, NMC 11007–11023, 11026, 11028–11035; USNM 50564, 173540, 187867, 102730, USNM Alaska King Crab Expedition 9–40, 12–40.

British Columbia (no other data): three lots comprising over fifty individuals, NMC 11024, 11025, 11027.

Monterey, California, from the Zoologische Staatssammlung, Munich: one lot comprising twenty individuals.

Description

Male: Head with one pair anteriorly pointing spines; body spiny, size and disposition of spines varying, mature females and immature males usually exhibiting longer spines than mature males; in some individuals the body spines may be so much reduced as to be hardly noticeable. Typical arrangement shown in Figure 8.

Length 22.5 mm; large specimens can be up to 30 mm in length.

Antenna 1 longer than cephalon plus pereonite II, flagellum equals peduncle article 2 and has nineteen articles; peduncle articles 1, 2, and 3 stout and

densely setose. Antenna 2 shorter than two basal articles of antenna 1, flagellum with swimming setae.

Mouthparts typical of genus, lacinia mobilis of right mandible denticulate, not five-toothed.

Gnathopod 1 propodus and dactylus grasping margin slightly serrate. Gnathopod 2 propodus large, more than twice as long as it is broad, palm with proximal grasping spine, small distal poison spine, and large triangular distal projection. Dactylus thickened proximally, tapering distally. Basis attached posteriorly on pereonite II, and bearing antero-lateral ridge.

Gills large, round, or oval.

Pereopods 5, 6, and 7 increasing in length posteriorly, propodus with proximal grasping spines.

Abdomen typical of genus.

Female: Length 11.6 mm. Differs from male in showing no lengthening of anterior pereonites; antenna 1 not greatly enlarged nor setose, flagellum with fifteen articles; antenna 2 longer than antenna 1 peduncle; gnathopod 2 attachment anterior to middle of pereonite II. Abdomen typical of genus.

Remarks

Fresh specimens, examined by the author, were translucent but had large orange pigment spots randomly distributed over the dorsal part of the body, and on all appendages except gills. The pattern of the spots was similar on both sides of the body. In certain collections the juveniles were little colored, the subadults highly colored, and mature animals less colored (*See also* Gardella (1962).)

Distribution

Type locality: Puget Sound, Washington.

Other localities: California coast south to Santa Barbara; off Oregon and Washington coasts; Friday Harbour, Washington; British Columbia; Popof Bay, Yakutat, Dutch Harbour, and Kodiak Harbour, Alaska.

New records: Pacific coasts of Oregon, Washington, and Vancouver Island; Queen Charlotte Islands; Washington and B.C. coasts of Strait of Georgia and Juan de Fuca Strait; mainland coast of B.C.

Discussion

The two species of *Metacaprella* are readily distinguishable because of the differences between the first antennae.

The males of these species also show a resemblance to *Caprella alaskana* and *C. ferrea.* Normally they can be distinguished from the *Caprella* species because they both have head spines rather than tubercles. Other obvious characters are the body spination and the peduncle of antenna 1 in *M. kennerlyi* and the long flagellum of antenna 1 in *M. anomala.*

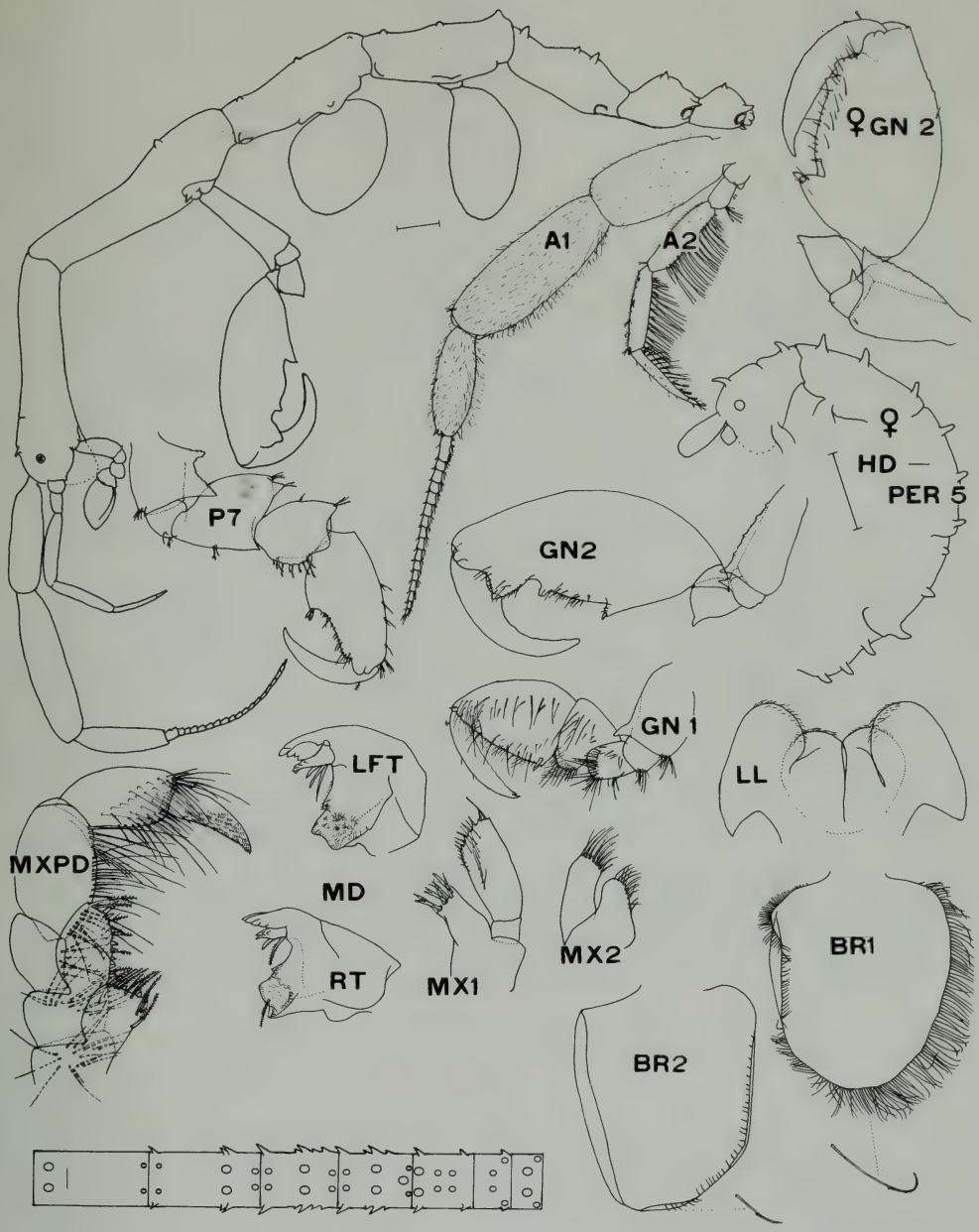
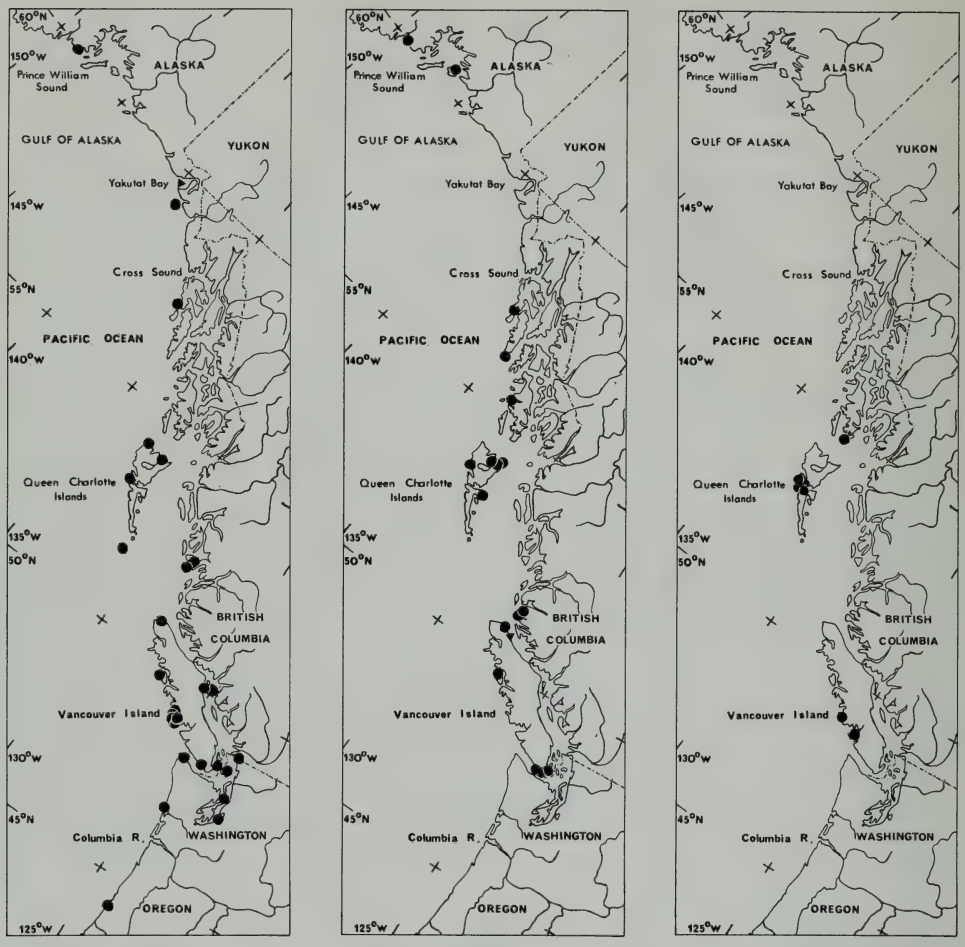


FIGURE 8 — *Metacaprella kennerlyi*. Male, lateral view and appendages. Female gnathopod 2 and brood plates, and anterior pereonites to show spination. Diagrammatic dorsal view of male showing typical arrangement of body spines.



Map fig. 3 — Known distribution of (a) *Metacaprella kennerlyi*, (b) *Caprella alaskana*, and (c) *C. ferrea* within the American Pacific boreal region.

Antenna 2 usually with swimming setae, flagellum biarticulate; mandibular palp absent; molar present; outer lobe of maxilliped larger than, or equal to, inner lobe; gills on pereonites III and IV; pereopods 3 and 4 absent; pereopod 5 six-segmented; abdomen of male with one pair of appendages and one pair of lobes, of female with one pair of lobes.

Caprella alaskana Mayer 1903 (Figure 9, Map 3)

Synonymy

Caprella alaskana Mayer 1903

Material Examined

Vancouver Island: over twenty males, seventeen females, stations F1, F2, 1955; N1, 07b, V5, 1959; H43, 1964; NMC 10913, 10914, 10921–10923, 10930; USNM 101292.

Queen Charlotte Sound: six males, seven females, station H39, 1964; NMC 10929.

Queen Charlotte Islands: over twenty males, seventeen females, stations W4, E21, H8a, H8b, H9, H14, 1957; NMC 10915–10920.

Alexander Archipelago: over ten males, over twenty females, stations A33, A168, A171, A175, 1961; NMC 10926–10928, 11006.

Prince William Sound: twelve males, fourteen females, stations A129, A151, 1961; NMC 10924, 10925.

Canoe Bay, Alaska: one juvenile, USNM Alaska King Crab Expedition 12–40.

Description

Male: Spination of head and body highly variable: the anterior pereonites may be smooth with blunt dorsal spines showing only on pereonites V to VII; or there may be dorsal spines on all pereonites and on head; antero-lateral projections on pereonites III and IV always present. Length 13.6 mm.

Antenna 1 very long, equal to distance from head to pereonite V inclusive; flagellum shorter than second peduncular article and having at least sixteen articles. Antenna 2 shorter than the two basal articles of antenna 1, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with strongly serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus length more than twice width; palm with proximal grasping spine and accessory spine, median to distal poison spine, distal triangular projection. Basis attached posteriorly on pereonite II, slender, with small antero-lateral ridge.

Gills oval.

Pereopods 5 to 7 increasing in length, propodus with proximal grasping spines.

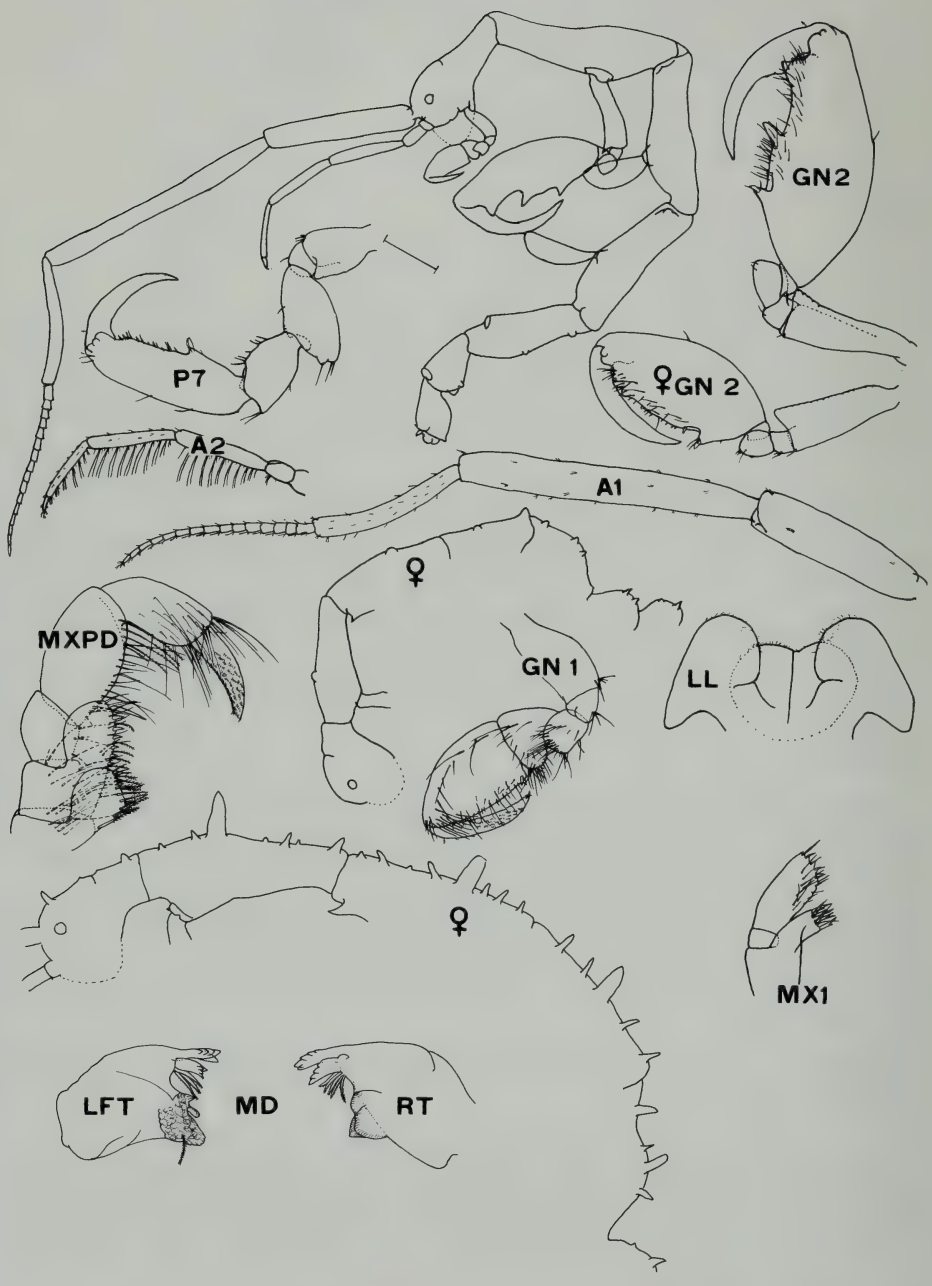


FIGURE 9 — *Caprella alaskana*. Subadult male, lateral view and appendages. Female gnathopod 2. Lateral views of two adult females, showing variations in spination, not to scale.

Abdomen typical of genus.

Female: Length 9.3 mm. Differs from male in being spinier; shows no lengthening of anterior pereonites; antenna 1 flagellum has eighteen articles; gnathopod 2 arises anteriorly on pereonite II. Abdomen typical of genus.

Remarks

Specimens of this species appear to show considerable variation in the degree of spination of their bodies. They range from the very spiny 'variety' of Mayer to his less spiny typical form to those, examined by the author, which are almost spineless. The females also show a variation from moderately spiny to extremely spiny, as shown in Figure 9. The differences are, in fact, so great that they create a doubt that these are members of the same species. As only one spiny female was found in the present material, and as no spiny males have been examined, no decision can be made on the specific status of the varieties.

All specimens examined showed multiplication of setae in the mandibular setal row.

Distribution

Type locality: not cited, probably Alaska.

Other localities: Aleutian Islands and Kodiak Island, Alaska; Fort Rupert, Vancouver Island, B.C.

New records: Prince William Sound and Alexander Archipelago, Alaska; Queen Charlotte Islands, Queen Charlotte Strait, and Vancouver Island, B.C.

Caprella ferrea Mayer 1903 (Figure 10, Map 3)

Synonymy

Caprella ferrea Mayer 1903

Metacaprella ferrea — Dougherty and Steinberg 1953; 1954

Material Examined

Vancouver Island: four males, nine females, station P6c, 1955; NMC 10951; one female, station H44, 1964; NMC 10957.

Queen Charlotte Islands: one male, station W8, 1957; four males, station W9, 1957; two males, one female, station W11, 1957; two males, station W12, 1957; NMC 10952–10955.

Alexander Archipelago: one male, one female, station A6, 1961; NMC 10956.

British Columbia (no other data): two males, two females, NMC 10958.

Description

Male: Body spination as follows: dorsally there is one pair of small blunt spines on the head; pereonite II has one large pair plus a variable number of pairs; pereonite III has one pair medianly plus other pairs; pereonite IV has median and posterior pairs; pereonite V has three pairs; and VI and VII have two pairs each; laterally there are anterior projections and spines over the gills on pereonites III and IV. Length of largest male found 9.4 mm; no adult male was found.

Antenna 1 longer than cephalon plus pereonites II and III, peduncle lightly setose, flagellum short (in adult it is shorter than third peduncular segment) and having up to sixteen articles. Antenna 2 shorter than the two basal articles of antenna 1 (the basal article in adult), flagellum with long swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate but not five-toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus length more than twice the width; palm with proximal grasping spine and accessory spine, small distal poison spine and triangular projection. Basis attached posteriorly on pereonite II, stout, with large antero-lateral ridge.

Gills oval.

Pereopods 5 to 7 short, propodus with proximal-medial grasping spines.

Abdomen typical of genus.

Female: Length 6.4 mm. Differs from male in having smaller head and body spines; antenna 1 is not noticeably long and the flagellum has ten articles; antenna 2 is longer than peduncle of antenna 1; gnathopod 2 arises anteriorly on pereonite II; abdomen typical of genus.

Remarks

Caprella ferrea was provisionally referred to genus *Metacaprella* by Dougherty and Steinberg (1953) because of its general resemblance to *M. kennerlyi* and *M. anomala*, although no females had been found at that time; examination of the female abdomen shows no evidence of rudimentary limbs, and so this species has been restored to *Caprella*. It can be most easily distinguished from the two *Metacaprella* species by the fact that it has paired spines postero-dorsally on pereonite IV whereas both *M. kennerlyi* and *M. anomala* have unpaired spines in this position; there is also the difference in the first antennae, which in *M. kennerlyi* are densely setose and in *M. anomala* have the very long flagellum.

Distribution

Type locality: Humboldt Bay, California.

Other localities: Moss Beach and Monterey Bay, California.

New records: Pacific coasts of Vancouver Island and Queen Charlotte Islands, B.C.; Alexander Archipelago, Alaska.

Discussion

C. ferrea and *C. alaskana* are extremely difficult to differentiate in the juvenile and immature stages. As adults, *C. alaskana* is very much more slender than *C. ferrea*, and the latter has a rougher body surface, always has headspines and frequently has small but definite tubercles laterally on the anterior pereonites. Pereonite V in *C. alaskana* is usually longer than VI plus VII and in *C. ferrea* is shorter than VI plus VII. However, in the immature stages where the spination

of the body is not properly developed, and where the proportions of the body are not established, these features are insufficient to distinguish between these two species. Until more detailed investigation reveals more reliable characters, it has been assumed that those immature specimens with no headspines are *C. alaskana* and those with headspines are *C. ferrea.*

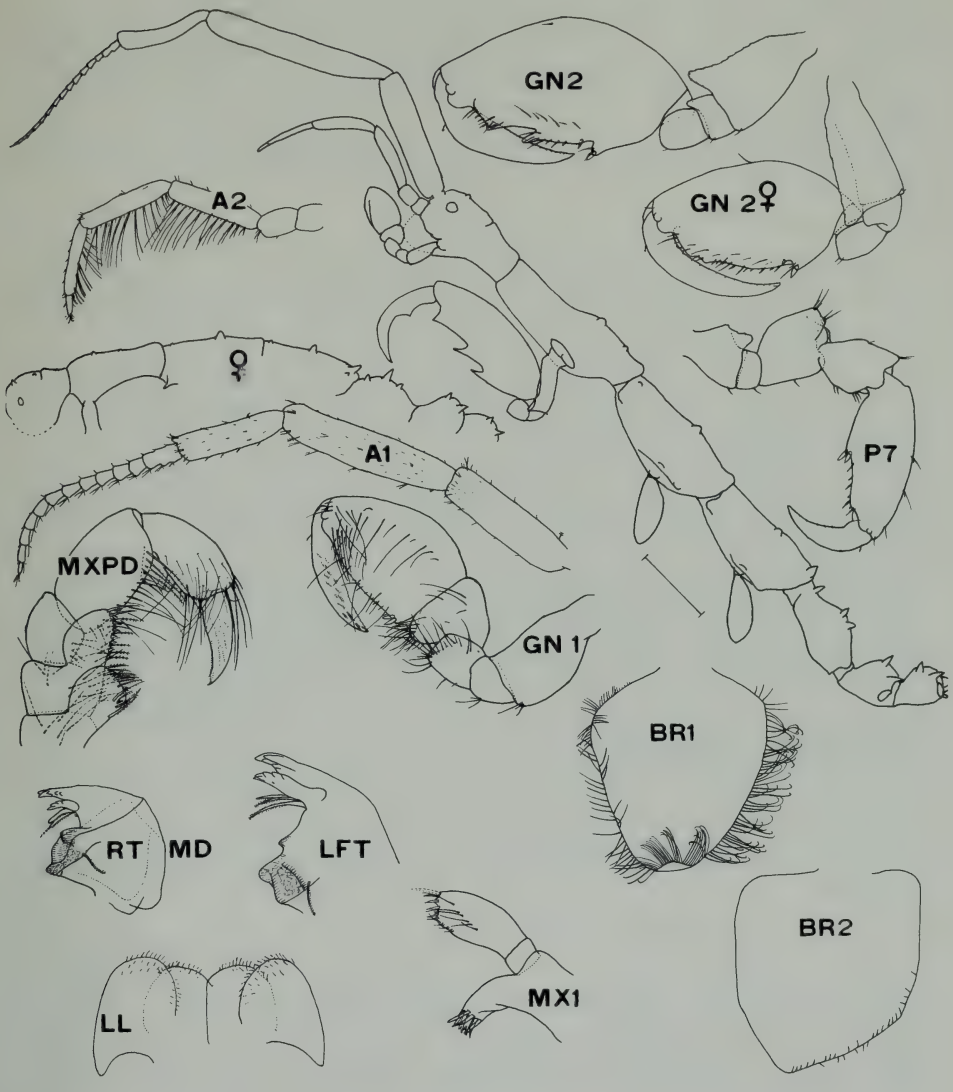


FIGURE 10 — *Caprella ferrea.* Subadult male, lateral view and appendages. Female gnathopod 2 and brood plates. Lateral view of adult female, to show dorsal spination, not to scale.

Caprella angusta Mayer 1903 (Figure 11, Map 4)

Synonymy (*see* Remarks)

Material Examined

Oregon Coast: four males, four females, stations W50, W57, W61, 1966; NMC 10900–10902.

Juan de Fuca Strait: one male, station W34, 1966; NMC 10899.

Vancouver Island: thirteen males, seven females, stations F1, P6c, 1955; 01, 03, 05, V3, V4b, V5, 1959; H44, 1964; NMC 10886, 10887, 10890–10896.

Queen Charlotte Sound: four males, two females, stations H50, H53, 1964; NMC 10897, 10898.

Queen Charlotte Islands: two males, two females, stations W8, W12, 1957; NMC 10888, 10889.

Description

Male: Head with median triangular anteriorly pointing spine; pereonites may be smooth or may have small paired dorsal tuberculations, particularly posteriorly. Length 10.8 mm.

Antenna 1 as long as or longer than cephalon plus pereonite II, flagellum just equal to peduncle and having twelve articles; antenna 2 longer than antenna 1 peduncle, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible indistinctly toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus twice as long as it is broad, palm with proximal poison spine with small proximal accessory spine, triangular or rectangular projection distally; some setae on palm. Dactylus thickened proximally, tapered distally, grasping margin denticulate. Basis attached anterior to middle of pereonite II, having antero-lateral ridge.

Gills fat, oval.

Pereopods 5 to 7 increasing in length, propodus palm concave, grasping spines proximal.

Abdomen typical of genus.

Female: Length 9.7 mm. Differs from male in having antenna 1 with nine articles; gnathopod 2 attached anteriorly on pereonite II, with small propodus bearing proximal grasping spine and accessory spine and evenly tapered dactylus. Abdomen typical of genus.

Remarks

Of the colored specimens examined, the females were completely pink, while the males had pink patches.

C. angusta has been "tentatively assigned" to *C. penantis* by McCain (1968); however, it appears to differ sufficiently from *C. penantis*, as figured and described by him, to justify its separate specific status. In general appearance *C. angusta* appears to be a slimmer and less setose animal than *C. penantis*; it shows no evidence of pleura; and the first and second gnathopods, as well as the mouthparts, have noticeably fewer setae. McCain states that the development of pleura and the stoutness of the body appear to be related to growth, "larger individuals having a robust body and well developed pleura." As his largest male and female were significantly longer than the largest specimens examined by the author, there may appear to be grounds for his decision to include *C. angusta* with *C. penantis*. However, there do appear to be other characters that are different in the two species, and it has been concluded that these are sufficiently significant to separate *C. angusta* from *C. penantis*.

	C. angusta	*C. penantis*
Antenna 1	setose	not setose
Pereonite I	equal to head	shorter than head
Gnathopod 2	propodus longer than arm	propodus equal to arm
Body spines	present or absent	absent
Setation (of appendages)	slight	strong

If *C. angusta* is indeed a true species, this leaves the 'acutifrons' varieties *natalensis*, *neglecta*, and *porcellio* in an ambiguous position. They are described by McCain as being essentially similar to *C. penantis*, except for the reduction of the setae on gnathopod 2. According to Vassilenko (1967), *C. neglecta* is a strongly setose type and differs from *C. angusta* also in the arrangement of the swimming setae on antenna 2. As specimens of these 'varieties' have not been examined by me, and as their descriptions in the literature indicate their having the typical *C. penantis* form, it has been deemed inadvisable to synonymize them with *C. angusta*.

It has been decided to keep the specific name *angusta*, as the specimens examined appear similar to Mayer's description and figure of his variety *angusta*; it is possible that either *C. spinifrons* Nicolet, 1849, or *C. novae-zealandiae* Kirk, 1878, may have precedence over this name, but until specimens from Chile or Australia and New Zealand can be examined, no decision about the valid name of this species can be made.

Distribution

Type locality: not cited, California.

Other localities: Dillon Beach, Pacific Grove, Santa Catalina, and Avalon, California.

New records: Pacific coasts of Oregon, Vancouver Island, Queen Charlotte Islands; Washington and B.C. coasts of Juan de Fuca Strait; Queen Charlotte Sound, and Queen Charlotte Strait, B.C.

La Follette's "*C. geometrica*" from Laguna Beach has not been included as there is some doubt whether this is *C. angusta*.

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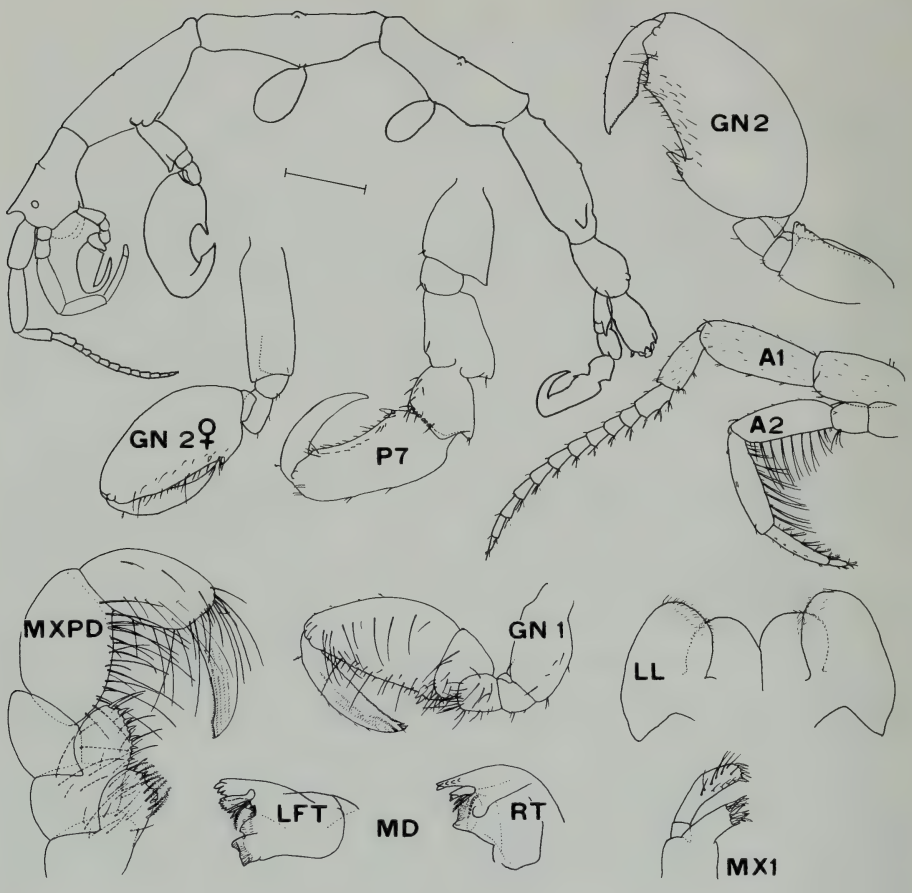


FIGURE 11 — *Caprella angusta*. Male lateral view and appendages. Female gnathopod 2.

Caprella incisa Mayer 1903 (Figure 12, Map 4)

Synonymy

Caprella acutifrons var. *incisa* Mayer 1903

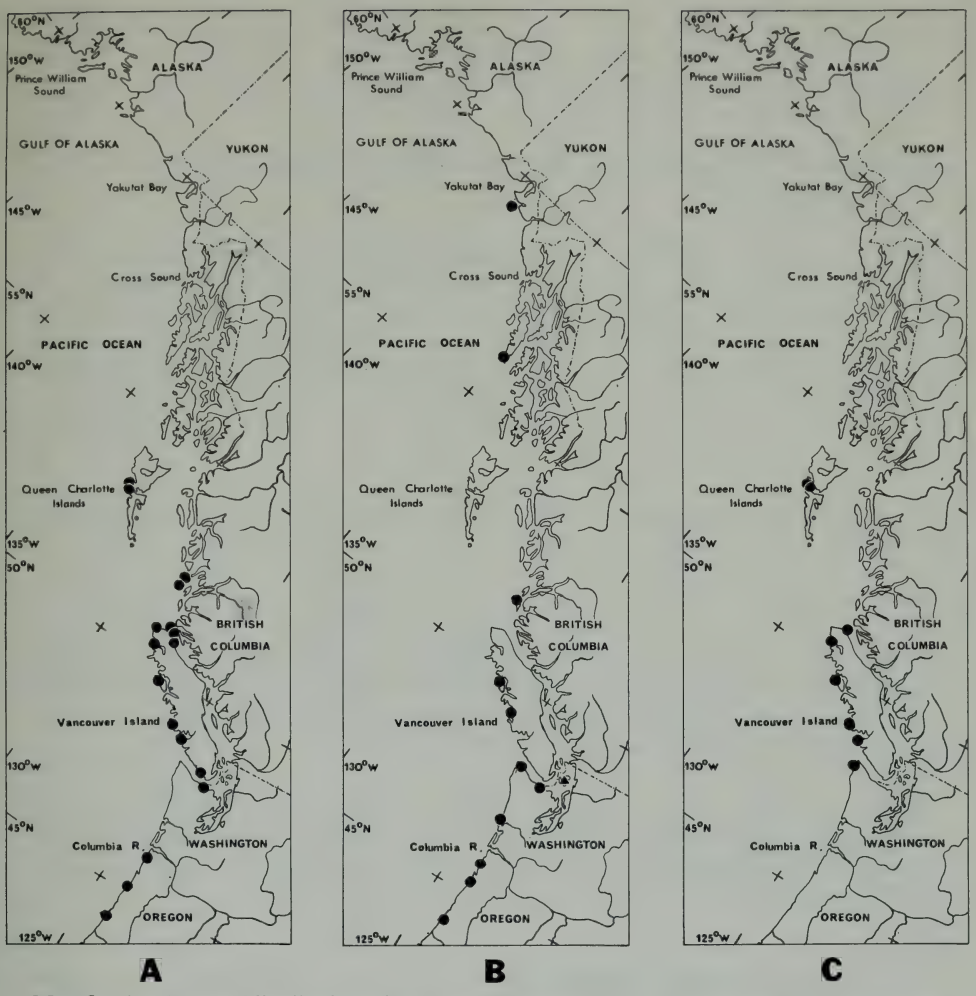
Caprella incisa — Dougherty and Steinberg 1953; 1954 — McCain 1968

Material Examined

Oregon Coast: over forty individuals, stations W57, W66, 1966; NMC 10880, 10881.

Washington Coast: six males, two females, stations W14, W35, W39, W50, 1966; NMC 10876–10879.

Vancouver Island: three males, four females, station O7b, 1959; NMC 10871; USNM 172360.



Map fig. 4 — Known distribution of (a) *Caprella angusta*, (b) *C. incisa*, and (c) *C. verrucosa* within the American Pacific boreal region.

Queen Charlotte Sound: one juvenile, station H1, 1964; NMC 10874.

Queen Charlotte Islands: one female, station JWS 92, 1965; NMC 10875.

Baranof Island: two males, stations A171–172, 1961; NMC 10873.

Off Dangerous River, Alaska: over forty individuals, station A156, 1961; NMC 10872.

British Columbia (no other data): seventeen males, eleven females, NMC 10882–10885.

Description

Male: Head with median triangular, anteriorly pointing spine; rest of body with paired and unpaired tuberculations on all pereonites; pleura present. Length 8.7 mm.

97949—4½

Antenna 1 longer than cephalon plus pereonite II, flagellum just shorter than peduncle and with eleven articles; peduncular articles 2 and 3, and distal portion of article 1, setose; antenna 2 longer than peduncle of antenna 1, flagellum with long swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with weakly serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus very large, breadth more than half length, palmar surface with median ventral-pointing poison spine, and distal rounded or rectangular projection. Dactylus thick proximally, tapered distally, grasping margin denticulate. Basis attached at middle of pereonite II, having large antero-lateral ridge.

Gills oval.

Pereopods 5 to 7 increasing in length, propodus palm concave, grasping spines proximal.

Abdomen typical of genus.

Female: Length 8.8 mm. Differs from male in that antenna 1 is not setose, flagellum having nine articles; gnathopod 2 attached anteriorly on pereonite II, and having small propodus with proximal grasping spine and median and distal palmar projections. Abdomen typical of genus.

Remarks

When this species showed any color, it had lateral and median dorsal bands of orange from the head to pereonite V inclusive; the color was slight or absent on all appendages.

Distribution

Type locality: not cited, California.

Other localities: Pacific Grove, Santa Catalina, Point Reyes, Dillon Beach, and Moss Beach, California; San Juan area, Washington.

New records: Pacific coasts of Oregon, Washington, Vancouver Island, and Alexander Archipelago; Washington coast of Juan de Fuca Strait, Queen Charlotte Sound, B.C.

Caprella verrucosa Boeck 1872 (Figure 13, Map 4)

Synonymy

Caprella verrucosa Boeck 1872 — Mayer 1882 — Dougherty and Steinberg 1953; 1954 — McCain 1968.

Caprella septentrionalis var. *verrucosa* Mayer 1890

Caprella acutifrons var. *verrucosa* Mayer 1903

Caprella acutifrons — La Follette 1914 (*non* Latreille 1816)

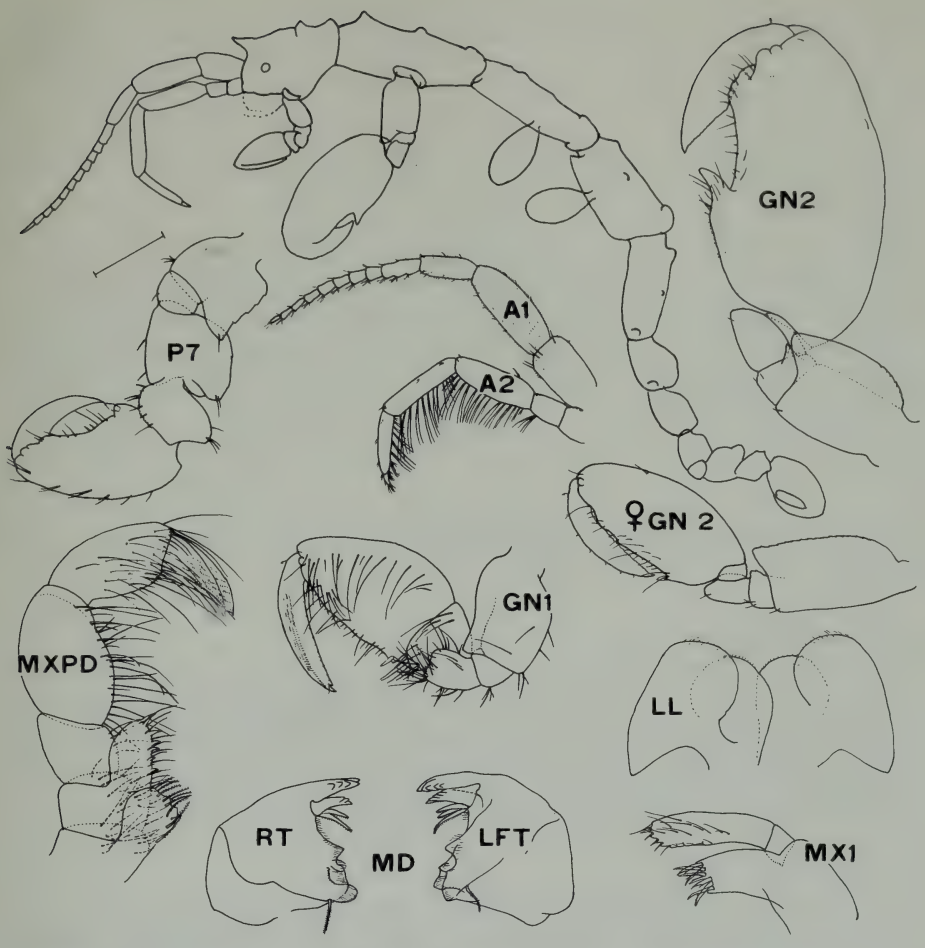


FIGURE 12 — *Caprella incisa*. Male, lateral view and appendages. Female gnathopod 2.

Caprella tuberculata Shaw 1916 (*non* Bate and Westwood 1868)
Caprella acutifrons f. *verrucosa* — Arimoto 1930 — Utinomi 1943; 1947

Material Examined

Washington Coast: one male, station W40, 1966: NMC 10869.

Vancouver Island: twelve males, five females, stations P6c, 1955; 03, 05, V3, 1959; H44, 1964; NMC 10862, 10866–10868, 10870.

Queen Charlotte Islands: one male, five females, stations W8, W9, W12, 1957; NMC 10863–10865.

Description

Male: Head with median triangular anteriorly pointing spine; rest of body with large blunt paired and unpaired spines dorsally, and laterally on pereonites II to V. Length 6.1 mm.

Antenna 1 longer than cephalon plus pereonite II, flagellum equal to peduncle articles 1 + 2, and with nine articles; antenna 2 longer than peduncle of antenna 1, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible not strongly denticulate.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus twice as long as it is broad; palmar surface with proximal anteriorly pointing poison spine and distal triangular or rectangular projection; antero-dorsal surface with tuberculations. Dactylus thick proximally, tapering distally, grasping margin denticulate. Basis attached to middle of pereonite II, having antero-lateral ridge.

Gills fat, oval.

Pereopods 5 to 7 increasing in length, propodus palm concave, grasping spines proximal.

Abdomen typical of genus.

Female: Length 5.1 mm. Differs from male in having seven articles to flagellum of antenna 1; antenna 2 nearly equals antenna 1 in length; gnathopod 2 propodus small, with proximal grasping spine and accessory spine, slight distal projection and evenly tapered dactylus. Abdomen typical of genus.

Distribution

Type locality: California, probably near San Francisco.

Other localities: Dillon Beach, Pacific Grove, Santa Catalina, Point Reyes, and Laguna Beach, California; Misaki, Yokohama, Tateyama Bay, and Onagawa Bay, Japan.

New records: Pacific coasts of Washington, Vancouver Island, and Queen Charlotte Islands.

Discussion

These three species of the so-called 'acutifrons' group are typically similar in their general body shape, the shape and armature of the second gnathopods, and the proportions of the antennae. They range from the almost smooth *C. angusta* through *C. incisa* with its tuberculations to *C. verrucosa* with its large blunt spines. *C. incisa* can be distinguished from *C. verrucosa* by its much smaller tuberculations, the finely setose antenna 1 and the very large propodus and antero-lateral ridge on the gnathopod 2. *C. angusta* can be distinguished from *C. incisa* by its almost smooth dorsal surface, normal sized gnathopod 2 propodus and basal ridge, the anterior attachment of the gnathopod 2, the absence of pleura, and of setae on antenna 1.

	C. incisa	*C. angusta*	*C. verrucosa*
Antenna 1 setae	many, short	sparse	absent
Gnathopod 2			
attachment	median	anterior	median
basal ridge	large, rectangular	triangular	triangular
propodus	width > ½ length	width = ½ length	width = ½ length
Body spines	small	minute, never on I	large
Pleura	present	absent	present

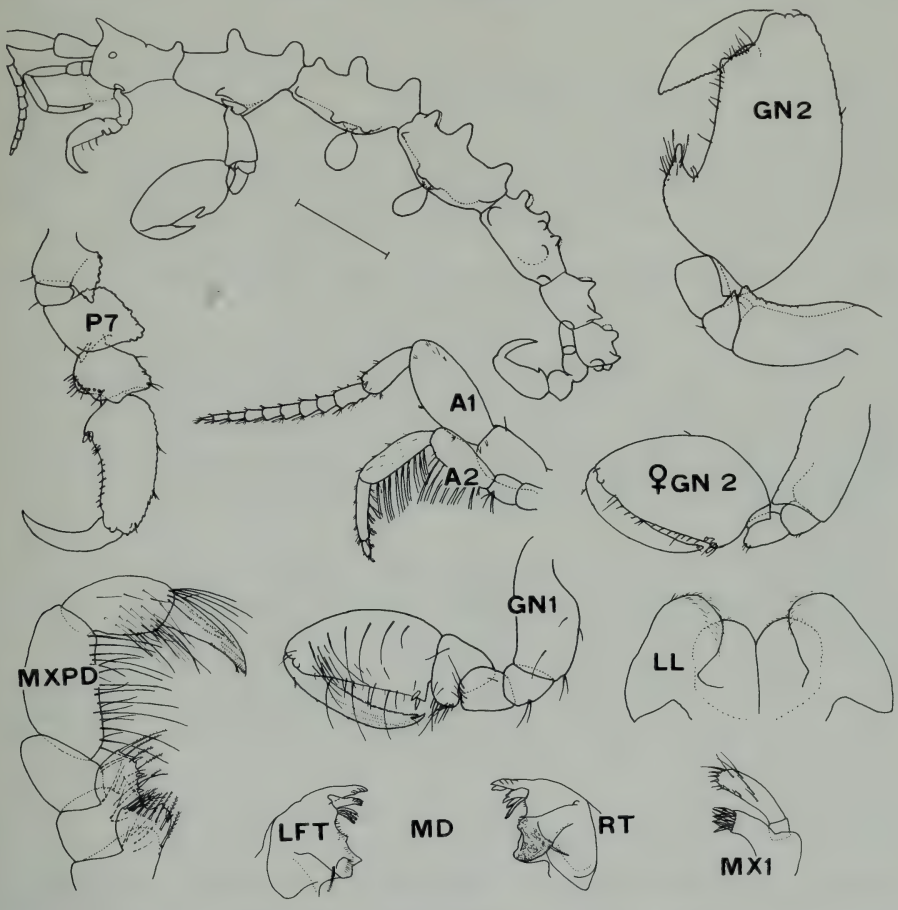


FIGURE 13 — *Caprella verrucosa.* Male, lateral view and appendages. Female gnathopod 2.

Caprella borealis Mayer 1903 (Figure 14, Map 5)

Synonymy

Caprella acutifrons var. *borealis* Mayer 1903
Caprella alaskensis Holmes 1904
Caprella borealis — Utinomi 1943*a*; 1947 — McCain 1968

Material Examined

Prince William Sound: two males, two females, stations A103, A115, A121, 1961; NMC 10859–10861.

Queen Charlotte Islands: fifteen males, four females, stations H8a, H8b, H9, E14a, W2, 1957; NMC 10854–10858.

Description

Male: Head with median tubercle over eye; paired dorsal tubercles present posteriorly on pereonite II, medially on pereonite III, medially and posteriorly on pereonite IV, and on V, VI, and VII; laterally there are tubercles anteriorly on pereonites III and IV, and over the point of attachment of the gnathopod 2 and the pereopods; other lateral and dorsal tuberculation variable. Length 7.2 mm. Pereonites I and II lengthen with maturity, pereonites III to VII are progressively shorter, VI plus VII longer than V.

Antenna 1 approximately equal to cephalon plus pereonite II, flagellum with seven articles, and shorter than peduncular articles 1 plus 2; antenna 2 just shorter than the two basal articles of antenna 1, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible finely denticulate.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus more than twice as long as it is broad; palm convex, with minute proximal projection, distal poison spine and more distal triangular process. Dactylus evenly tapered, inner margin denticulate. Basis attached posterior to the middle of pereonite II, short and with antero-lateral ridge; ischium with large spine-like antero-lateral projection.

Gills small, oval.

Pereopods 5 to 7 progressively longer; propodus palmar surface variable: in immature males and in all females the palm is not delineated but bears a few small spines; in adult males there may be a progression from this type of propodus on pereopod 5 to one showing true palmar development, with a cluster of four or five proximal grasping spines and with palmar spines on pereopod 7.

Abdomen typical of genus.

Female: Length 5.5 mm. Differs from the male in showing no lengthening of anterior pereonites; antenna 1 flagellum with five articles, antenna 2 longer than antenna 1 peduncle; gnathopod 2 attached anteriorly on pereonite II, no spine on ischium, propodus not elongate and bearing proximal grasping spine with accessory spine and two small distal projections, dactylus not serrate. Abdomen typical of genus.

Distribution

Type locality: Cape Lopatka, Kamchatka Peninsula, USSR.

Other localities: Copper Island, Kamchatka Peninsula, USSR; Akkeshi Bay, Japan; Orca, Prince William Sound, Alaska.

New records: Northern Prince William Sound, Alaska; Queen Charlotte Islands, B.C.

Discussion

Mayer included *C. borealis* among his varieties of "*C. acutifrons*"; however, this species is different from the typical 'acutifrons' varieties, particularly in the type of head spine, in the point of attachment of gnathopod 2, and in the lengthening of the anterior segments, and was given separate specific status by Utinomi (1943*a*).

There is a great similarity between this species and *C. alaskensis* Holmes 1904. Unfortunately Holmes did not make any mention of the size of his incomplete specimen, but if, as appears likely, it was a large adult male, any differences between it and *C. borealis* can be accounted for by its maturity: i.e., the comparative lengths of pereonites I and II, the more posterior position of gnathopod 2, the enlarged spine on the ischium, and the absence of the proximal projection on the palm of gnathopod 2. It has not been possible to locate Holmes's single specimen for comparative study, but it seems certain that these two species are the same, and I have, therefore, assigned *alaskensis* to species *borealis*.

Caprella californica Stimpson 1857 (Figure 15, Map 5)

Synonymy

Caprella californica Stimpson 1857; 1863 — Boeck 1871 — Mayer 1882 — Holmes 1909 — Dougherty and Steinberg 1953; 1954 — Gardella 1962 — Saunders 1966 — McCain 1968

Caprella scaura—Stebbing 1888 — Johnson and Snook 1927 — Wailes 1931 — Light 1941 — Ricketts and Calvin 1952; (*non* Templeton 1836)

Caprella scaura var. *californica* Mayer 1890; 1903

Caprella scaura var. *scauroides* Mayer 1903 — Utinomi 1947

Caprella scaura var. *spinirostris* Mayer 1890; 1903

Material Examined

Queen Charlotte Islands: five males, four females, stations E5, E25, W3a, W15b, 1957; 3532, 1935; NMC 10959, 10962–10965.

Hecate Strait: over twenty males, over twenty females, stations H8, H23, 1964; NMC 10973, 10974.

Queen Charlotte Sound: nine males, over twenty females, stations H53, H57, H58, 1964; NMC 10976–10978.

Vancouver Island: over forty males, twenty-seven females, stations M2, P2, 1955; O2b, O4, O6, O7a, O7b, O7d, O13, 1959; H44, 1964; NMC 10960, 10961, 10966–10972, 10975.

Washington coast: over twenty males, fourteen females, stations W46, W47, 1966; NMC 10979, 10980.

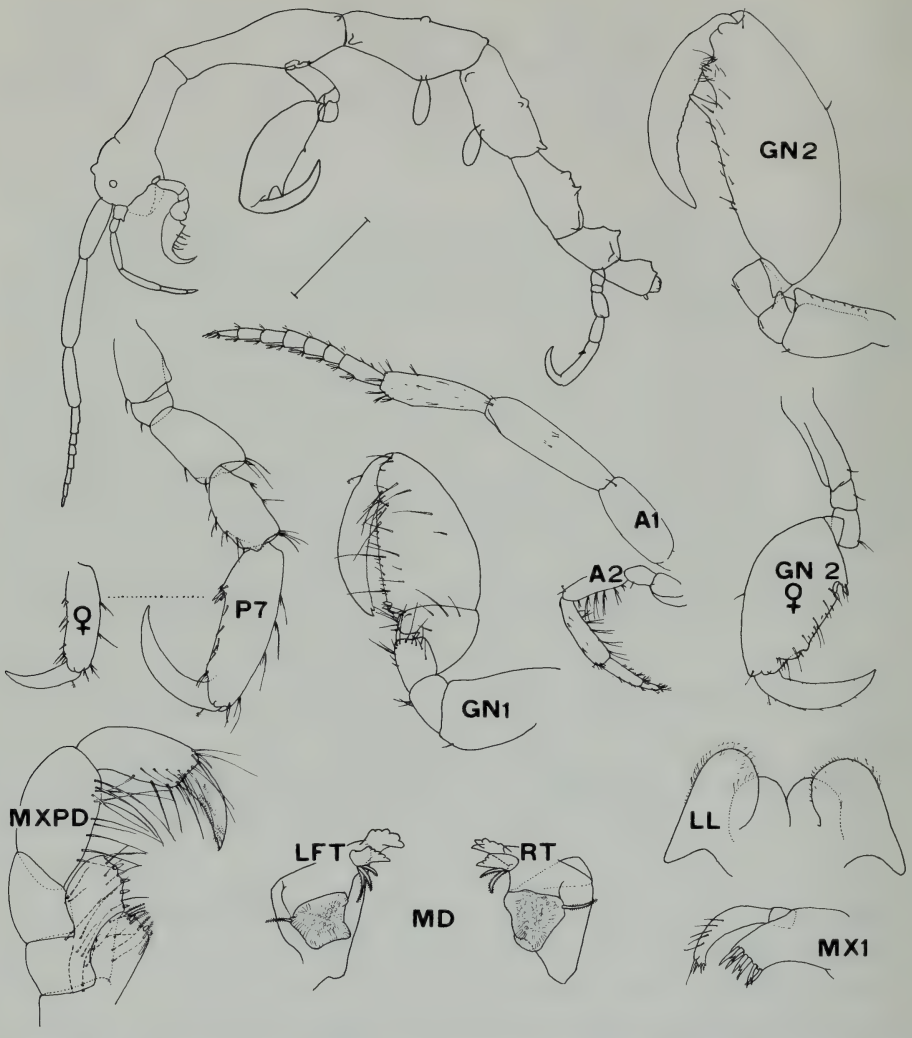
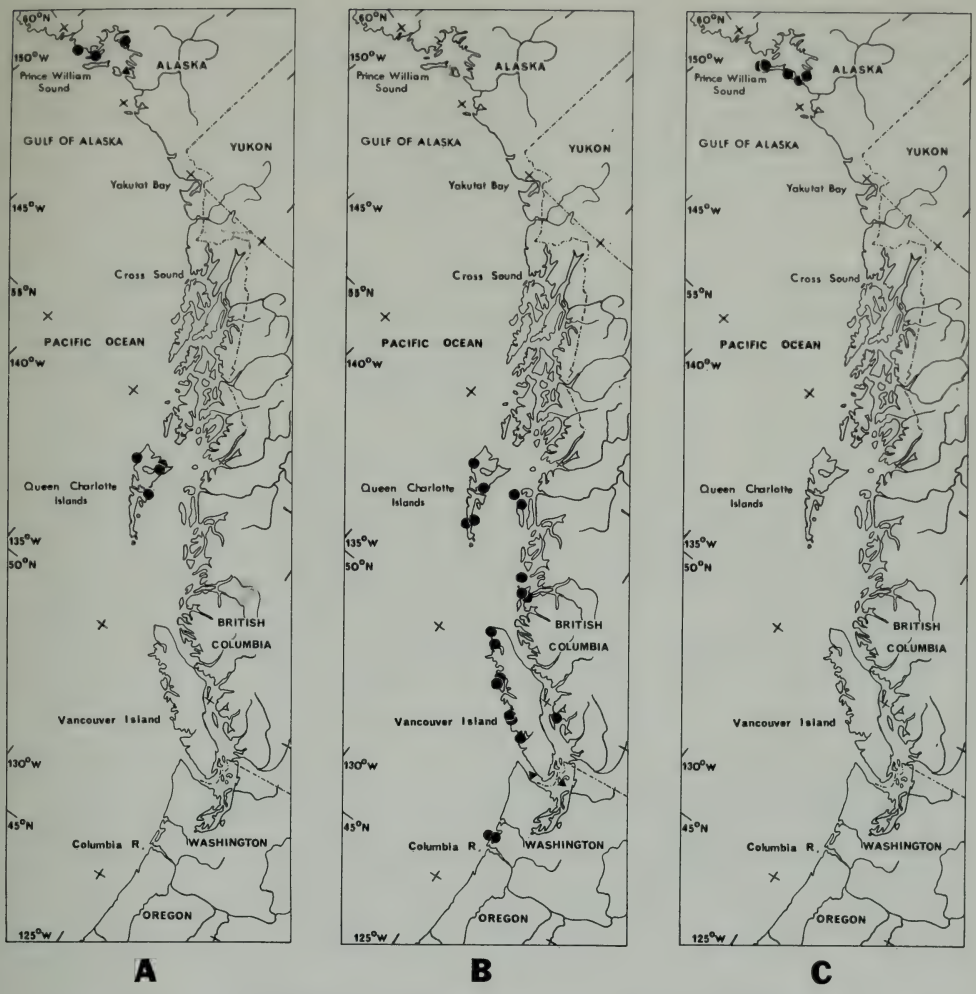


FIGURE 14 — *Caprella borealis*. Male, lateral view and appendages. Female gnathopod 2 and propodus of pereopod 7.

Description

Male: Body spination variable, but long slender anteriorly pointing cephalic spine, and small ventral spine between the insertions of the second gnathopods, always present. Spination of body varies from antero-lateral spines on pereonites III and IV but no dorsal spines, to antero-lateral spines on pereonites III to VI, lateral spines over gills on pereonite III, median dorsal spine posteriorly on pereonite II, medianly and posteriorly on III and IV, medianly on V, and two pairs on VI. Length 21.5 mm.

Antenna 1 longer than cephalon plus pereonites II and III, flagellum shorter than peduncle article 2 and with nineteen articles. Antenna 2 shorter than antenna 1 peduncle articles 1 plus 2, flagellum with swimming setae.



Map fig. 5 — Known distribution of (a) *Caprella borealis*, (b) *C. californica*, and (c) *C. drepanochir* within the American Pacific boreal region.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with serrate grasping margins to dactylus and propodus. Gnathopod 2 propodus longer than basis, and four times longer than it is wide, narrow proximally and widening distally; palmar surface with two strong projections, one medial with associated accessory spine, the second halfway between the proximal projection and a distal triangular projection; proximal and antero-distal surfaces setose. Dactylus short. Basis attached posteriorly on pereonite II and bearing an antero-lateral projection distally.

Gills long, elliptical.

Pereopods 5 to 7 increasing in length; propodus palmar surface concave, grasping spines proximal.

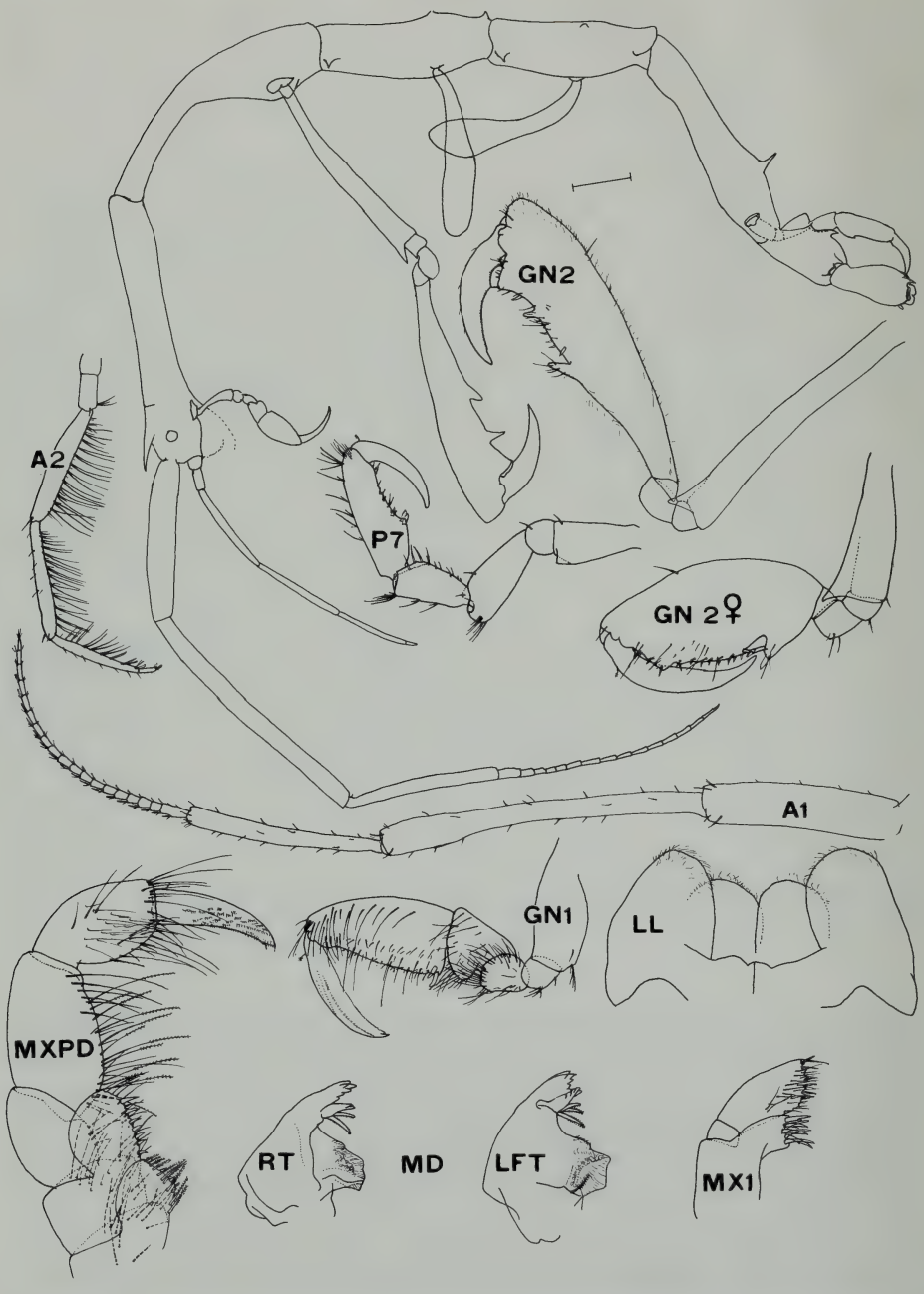


FIGURE 15 — *Caprella californica.* Male, lateral view and appendages. Female gnathopod 2.

Abdomen typical of genus.

Female: Length 11 mm. Differs from male in showing no lengthening of anterior pereonites; antenna 1 flagellum has seventeen articles; antenna 2. as long as peduncle of antenna 1; gnathopod 2 attached just anterior to middle of pereonite II, propodus not elongated, palm with proximal grasping spine and accessory spine and minute distal poison spine, basis short. Abdomen typical of genus.

Remarks

According to Gardella (1962) the color of the male is "typically dark brown, but varies to a dark greenish-brown. The claws are tipped with white and have red polka dots. The female is usually a light greenish-brown with green second legs and red polka dots on all the claws, but the color may vary to nearly black."

Distribution

Type locality: San Francisco Bay, California.

Other localities: California from San Diego to Humboldt Bay; Juan de Fuca Strait and San Juan area, Washington; British Columbia; Caldera, Chile; Tsugaru Strait and off southwestern Japan; Korea Strait and off Korea; Formosa Strait and South China Sea.

New records: Pacific coasts of Washington and Vancouver Island; Queen Charlotte Islands, Hecate Strait, Queen Charlotte Sound, and Strait of Georgia, B.C.

Discussion

Mayer separated three varieties, having the ventral spine between the second gnathopods, from *Caprella scaura;* these he distinguished from each other on the basis of the spination of pereonite V. It has been seen that the spination of *C. californica* is highly variable, and it appears probable that varieties *spinirostris* and *scauroides* are true members of this species. Although I have not been able to examine Asian or South American material, I have decided to assign these two varieties to *Caprella californica.*

Caprella drepanochir Mayer 1890 (Figure 16, Map 5)

Synonymy

Caprella drepanochir Mayer 1890; 1903 — Shoemaker 1920 — Utinomi 1943*a*; 1947

Material Examined

Bristol Bay, Alaska: one male, one juvenile, USNM Alaska King Crab Expedition D6-41.

Prince William Sound: over one hundred individuals, stations A80, A81, A139, A140, A153, 1961; NMC 10903–10907.

Description

Male: Head and body smooth except for antero-lateral projections on pereonite III. Length 12.4 mm.

Antenna 1 approximately equal to cephalon plus pereonite II; peduncular articles 2 and 3 setose; flagellum shorter than peduncular articles 1 plus 2 and with eleven articles. Antenna 2 longer than antenna 1 peduncle, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate but not five-toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus very large, width less than half length; palmar surface with small proximal spine, large distal poison spine separated by cleft from more distal triangular projection. Dactylus heavy and slightly curved, inner margin

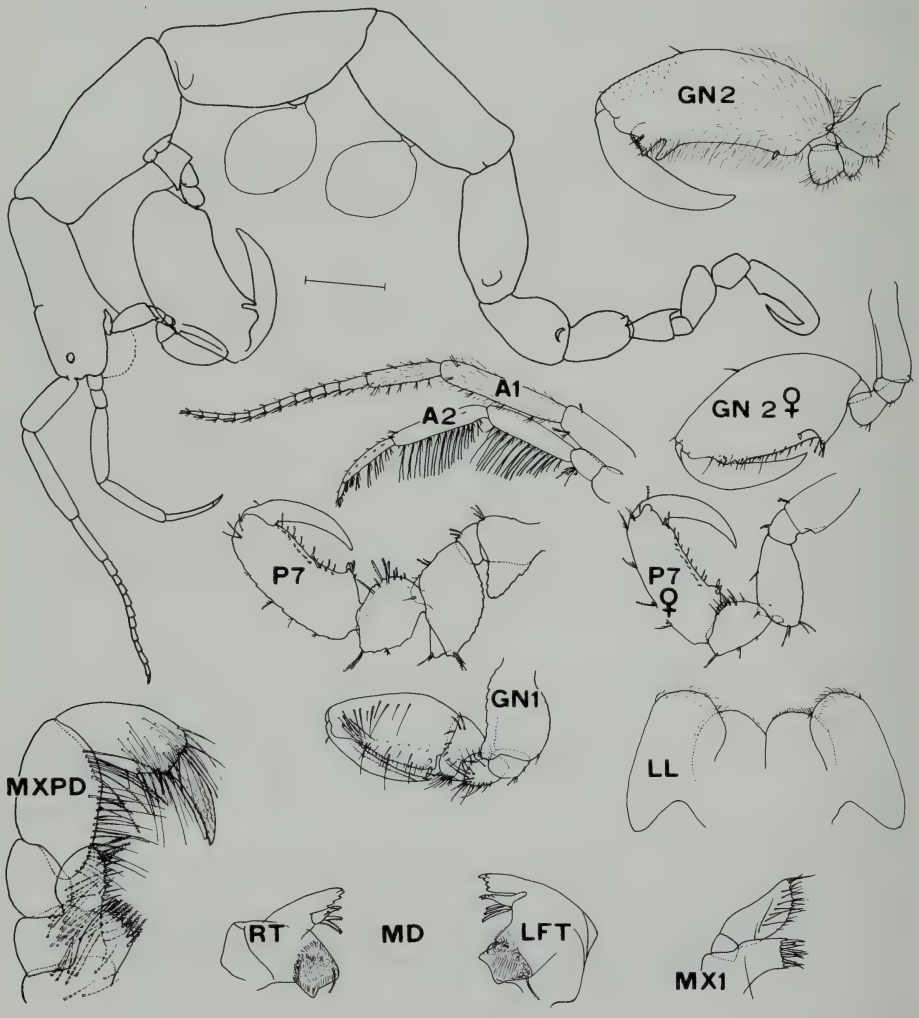


FIGURE 16 — *Caprella drepanochir*. Male, lateral view and appendages. Female gnathopod 2 and pereopod 7.

slightly denticulate. Basis attached just posterior to middle of pereonite II, having lateral and medial anterior ridges. The whole limb is setose except for the distal portion of the propodus, which is tuberculate, and the dactylus.

Gills round.

Pereopods 5 to 7 show slight increase in length posteriorly; propodus palm concave with proximal grasping spines.

Abdomen typical of genus.

Female: Length 7.7 mm. Differs from male in having short pereonite I; antenna 1 flagellum with ten articles; gnathopod 2 propodus palm has proximal grasping spine and accessory spine, distal minute poison spine; pereopods much more slender. Abdomen typical of genus.

Distribution

Type locality: Not cited, probably China.

Other localities: Vladyvostok and Beringa Island, USSR; Akkeshi Bay, Japan; Chamisso Harbour, Eschscholtz Bay, and Port Clarence, Alaska.

New records: Southern Prince William Sound, Alaska.

Discussion

Mayer (1903) mentions a "northern variety" of *C. drepanochir*, to which the specimens in NMC bear a greater resemblance than to the 'typical' form; however, study of specimens of the "variety" indicates that there is little difference between them and those of the typical form, except that they appear to be sturdier. It has been concluded that both forms belong to the same species. The specimens described by Utinomi (1943*a*) appear to be immature, particularly from the description of the gnathopod 2, which is typical of the immature male.

Caprella equilibra Say 1818 (Figure 17, Map 6)

Synonymy

Refer to McCain (1968); *see also* Light 1941

Material Examined

Vancouver Island: six males, one female, stations P6c, F1, 1955; O1, O3, O5, O11, 1959; NMC 10989–10994.

Hecate Strait: three males, two females, stations H10, H33, 1964; NMC 10995, 10996.

Queen Charlotte Sound: five males, over ten females, station H53, 1964; NMC 10997.

Description

Male: Head and body smooth dorsally except for pereonite V which may have paired spines; laterally there are large anteriorly pointing spines at the bases of the second gnathopods, antero-lateral spines on pereonites III and IV;

pereonite V is distinctly sculptured anteriorly giving the appearance of large lateral spines. Ventrally there is a large spine between the bases of the second gnathopods. No mature male was found, largest male length 10.2 mm.

Antenna 1 as long as cephalon plus pereonite II, flagellum less than one-quarter of its total length. Antenna 2 shorter than the two basal articles of antenna 1, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

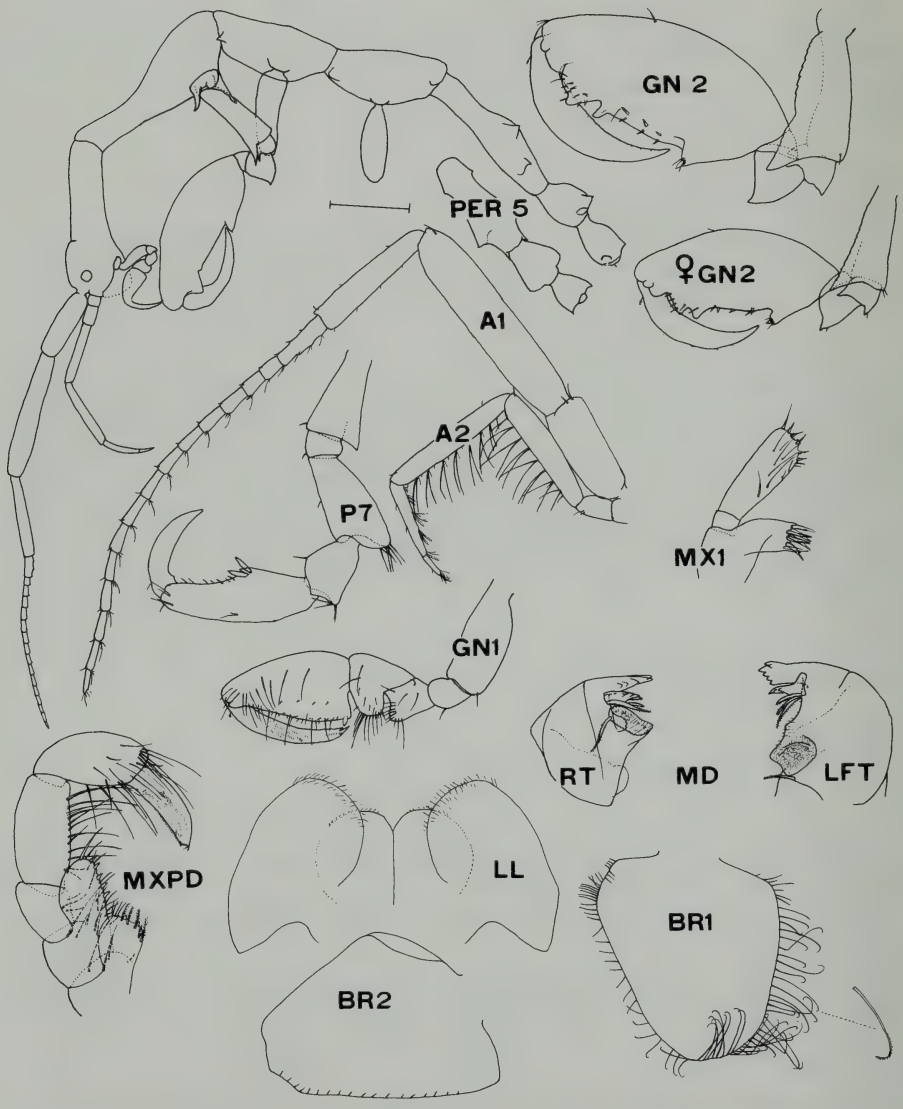
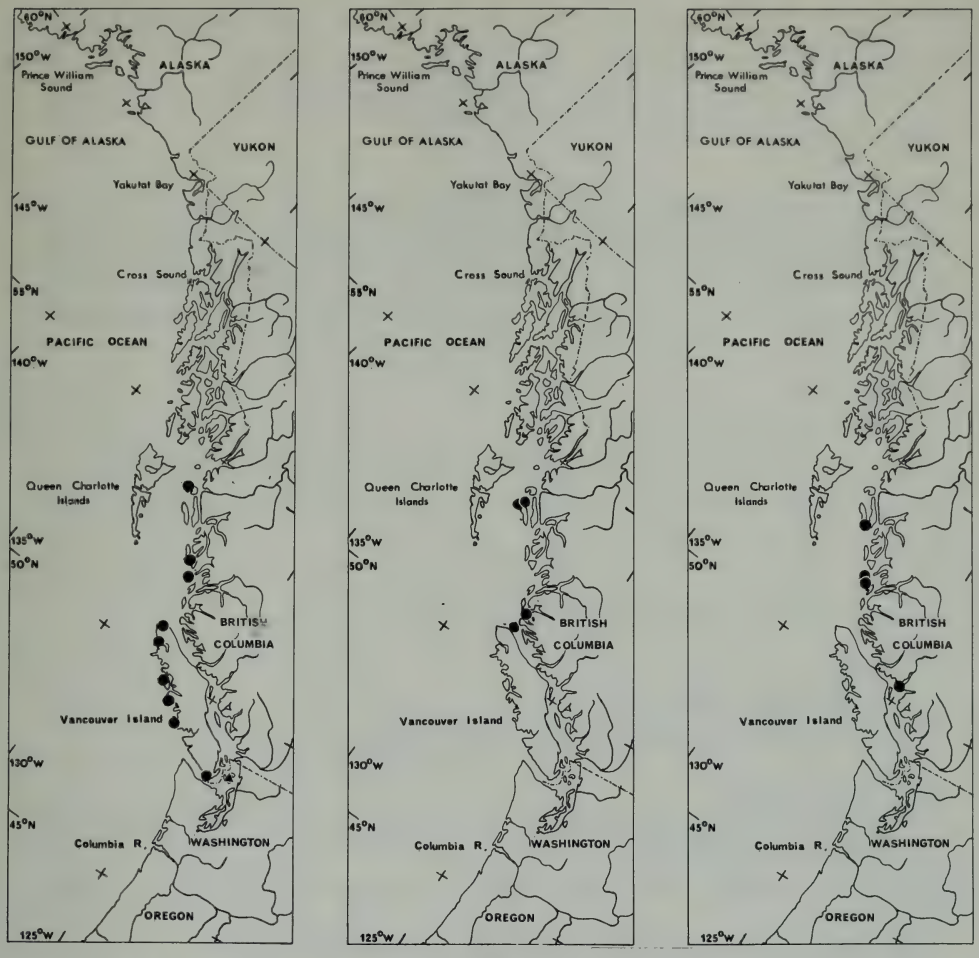


FIGURE 17 — *Caprella equilibra*. Subadult male, lateral view, appendages, and dorsal view of pereonite V. Female gnathopod 2 and brood plates.



Map fig. 6 — Known distribution of (a) *Caprella equilibra*, (b) *C. mendax*, and (c) *C. pilidigita* within the American Pacific boreal region.

Gnathopod 1 with barely serrate grasping margin to propodus and dactylus.

Gnathopod 2 propodus with proximal grasping spine, distal triangular projection with poison spine just proximal to it; size of poison spine appears to decrease with age. Basis attached posteriorly on pereonite II; in the adult it is shorter than half pereonite II and is produced in an antero-lateral ridge ending in a spine-like process.

Gills large, oval.

Pereopods 5, 6, and 7 increasing in length posteriorly; propodus with proximal grasping spines, palm slightly concave, with few spines.

Abdomen typical of genus.

Female: Length 7.2 mm. Differs from male in showing no lengthening of anterior pereonites; antenna 2 equal in length to peduncle of antenna 1; gnathopod 2 attached anteriorly on pereonite II and having a longer basis.

Abdomen typical of genus.

Remarks

There are certain small differences between the specimens examined from the Pacific, and the descriptions of this species from the Atlantic. As this is an extremely widespread species it is more than likely that variations will be found within its range; until large numbers of adult males can be studied no decision can be reached on the exact taxonomic status of these variations.

Distribution

Type locality: South Carolina.

Other localities: See McCain (1968); also San Juan area, Washington.

New records: Vancouver Island, Queen Charlotte Sound, and Hecate Strait, B.C.

Caprella mendax Mayer 1903 (Figure 18, Map 6)

Synonymy

Caprella mendax Mayer 1903

Caprella equilibra — Dougherty and Steinberg 1953

Material Examined

Hecate Strait: seven males, one female, stations H21, H23, H37, 1964; JWS 85, 1965; NMC 10999–11002.

Vancouver Island: eleven males, eleven females, station V3, 1959; NMC 10998.

San Juan Islands: ten males, one female, USNM 187867.

Description

Male: Body smooth, except pereonite II, which has a single ventral spine between the bases of the second gnathopods and a small spine at the base of each second gnathopod. Length 16.4 mm.

Antenna 1 longer than cephalon plus pereonites II and III, flagellum shorter than peduncle articles 1 plus 2 and with nineteen articles. Antenna 2 shorter than the two basal articles of antenna 1, flagellum with short setae.

Mouthparts typical of genus, lacinia mobilis of right mandible denticulate, not five-toothed.

Gnathopod 1 with slightly serrate margin to dactylus and propodus. Gnathopod 2 propodus with proximal grasping spine with small accessory spine, distal triangular projection with poison spine just proximal to it. Basis attached posteriorly on pereonite II, shorter than half pereonite II and having antero-lateral projection.

Gills elliptical.

Pereopods 5, 6, and 7 increasing in length posteriorly; propodus with proximal grasping spines and few spines on the concave palm.

Abdomen typical of genus.

Female: Length 11.2 mm. Differs from male in showing less elongation of anterior pereonites; antenna 1 flagellum longer than peduncle articles 1 plus 2 and having sixteen articles; antenna 2 shorter than peduncle of antenna 1.

Abdomen typical of genus.

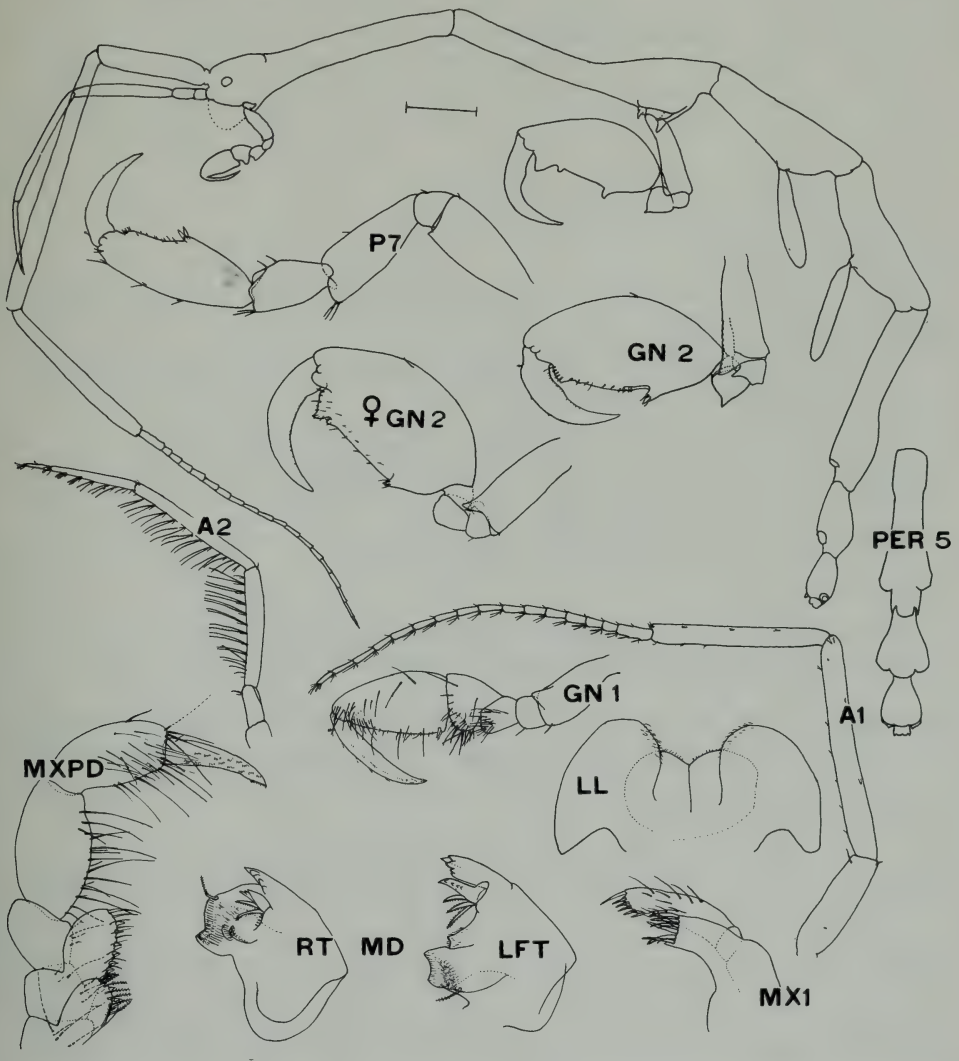


FIGURE 18 — *Caprella mendax*. Male, lateral view, and dorsal view of pereonite V. Subadult male, appendages. Female gnathopod 2.

97949—5½

Remarks:

Mayer distinguished *C. mendax* from *C. equilibra* on the basis of the structure of the second gnathopod, and the long pereonite V in *C. mendax* as contrasted with the short pereonite V in *C. equilibra.* Mayer's distinction appears rather tenuous in his monograph; however, from studying his specimens in USNM it appears that there is a definite difference between these two species. The specimens named here as *C. mendax* show slight differences from the type in the gnathopod 2 but are otherwise similar, and it has been decided to reinstate this species as valid and to include these specimens in it.

Distribution

Type locality: not cited, California.

Other localities: Pacific Grove, Santa Barbara, and San Diego, California.

New records: Vancouver Island and Hecate Strait, B.C.; San Juan Islands, Washington.

Caprella pilidigita n. sp. (Figure 19, Map 6)

Material Examined

Male holotype, NMC 10985, Townsend Point, St. John Harbour, Athlone Island, B.C., station H53, 1964.

Over thirty male paratypes, NMC 10986, Townsend Point, St. John Harbour, Athlone Island, B.C., station H53, 1964.

Two males, NMC 10987, Goose Island, B.C., station H50, 1964.

One male, NMC 10988, Cox Point Inlet, Trutch Island, B.C., station H26, 1964.

Two males, USNM 101292, Stuart Island, B.C.

Description

Male: Body smooth except for a small ventral spine between the bases of the second gnathopods. Length 9.4 mm. Pereonites I and II elongated in adult.

Antenna 1 longer than cephalon plus pereonites II and III; flagellum equals peduncle article 2 and has twelve articles; distal portion of third peduncular article setose. Antenna 2 shorter than the two basal articles of antenna 1, flagellum with short setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with slightly serrate grasping margin to propodus and dactylus.

Gnathopod 2 propodus with proximal grasping spine, distal triangular projection with small poison spine proximal to it; dactylus with hairs along inner margin. Basis attached posteriorly on pereonite II and having slight anterolateral projection; ischium and merus square, with no projection.

Gills small, elliptical.

Pereopods 5, 6, and 7 increasing in length posteriorly; propodus with proximal grasping spines, and many spines on concave palm. Abdomen typical of genus.

Female: No female specimens were found.

Remarks

The specific name refers to the dactylus of gnathopod 2.

Distribution

Type locality: latitude 52° 12′ N, longitude 128° 29′ W, Townsend Point, St. John Harbour, station H53/64; NMC 10985.

Other localities: Hecate Strait, Queen Charlotte Sound, and Johnstone Passage, B.C.

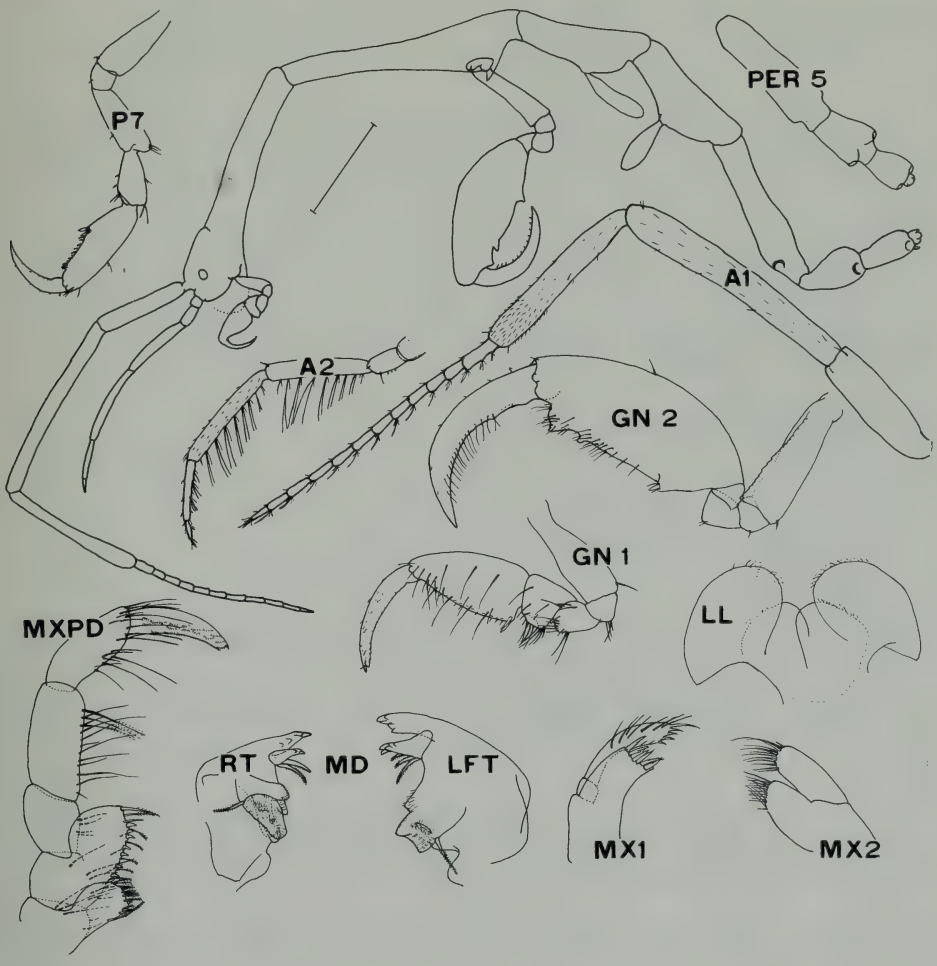


FIGURE 19 — *Caprella pilidigita.* Male holotype, lateral view, and dorsal view of pereonite V. Male paratype, appendages.

Discussion

The species *Caprella equilibra*, *C. mendax*, and *C. pilidigita* are very similar in appearance, but their differences have been considered sufficient to name them three different species rather than variants of *C. equilibra.*

	C. equilibra	*C. mendax*	*C. pilidigita*
Antenna 1 length	= pereonites I + II	> pereonites I + II + III	> pereonites I + II + III
flagellum length,	$\frac{1}{4}$ total antenna	> $\frac{1}{5}$ total antenna	= peduncle segment 2
no. of articles	12–16	19	12
Gnathopod 2 basis,	$\frac{1}{4}$ of appendage	$\frac{1}{3}$ of appendage	$\frac{1}{3}$ of appendage
ventral spine,	large	large	small
basal spines	large	small	absent
Pereonite III and IV lateral	anterior spines	no spines	no spines
Pereonite V, lateral	anterior spines	no spines	no spines
length	⩽ pereonite IV	> pereonite IV	> pereonite IV

The species *C. piligidita* appears definitely different from *C. equilibra* and *C. mendax*, particularly in the structure of the gnathopod 2, the body spines, and the setation of antenna 1. The difference between *C. equilibra* and *C. mendax* has been harder to assess because of the scarcity of adult males. Such ecological information as is available indicates that *C. mendax* is found mainly in deep water while *C. equilibra* is found both in deep water and intertidally. It is hoped that new material will be collected to help solve the status of these two species; meanwhile *C. mendax* is being separated from *C. equilibra* on the basis of the antenna 1, pereonite V, and differences between the females.

Caprella gracilior Mayer 1903 (Figure 20, Map 7)

Synonymy

Caprella linearis var. *gracilior* Mayer 1903

Caprella gracilior—Dougherty and Steinberg 1953; 1954

Material Examined

Prince William Sound: over fifty individuals, stations A85 (40 ft.), A102 (60 ft.), A103 (66 ft.), 1961; NMC 10908–10910.

Alexander Archipelago: two males, one female, stations A165, 1961 (120 ft.); JWS 85, 1965 (30 fm); NMC 10911, 10912.

Description

Male: Head and body usually smooth anteriorly and with two pairs of dorsal tubercles on pereonite V. Length 16.3 mm. This animal is very slender, with pereonites I and II much elongated.

Antenna 1 longer than cephalon plus pereonite II; peduncle with second article longer than first plus third articles; flagellum shorter than the two basal articles of the peduncle and with at least fifteen articles. Antenna 2 shorter than the two basal articles of antenna 1, swimming setae short and sparse.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, not five-toothed.

Gnathopod 1 with strongly serrate grasping margin to propodus and dactylus. Gnathopod 2 three times longer than it is broad, extreme distal portion setose; palm with proximo–medial grasping spine and accessory spine, distal poison spine separated by a cleft from a more distal triangular projection. Dactylus curved, finely tapered, with short hairs along grasping edge. Basis attached posteriorly on pereonite II, to which it is of approximately equal length; it is nearly twice the length of the propodus.

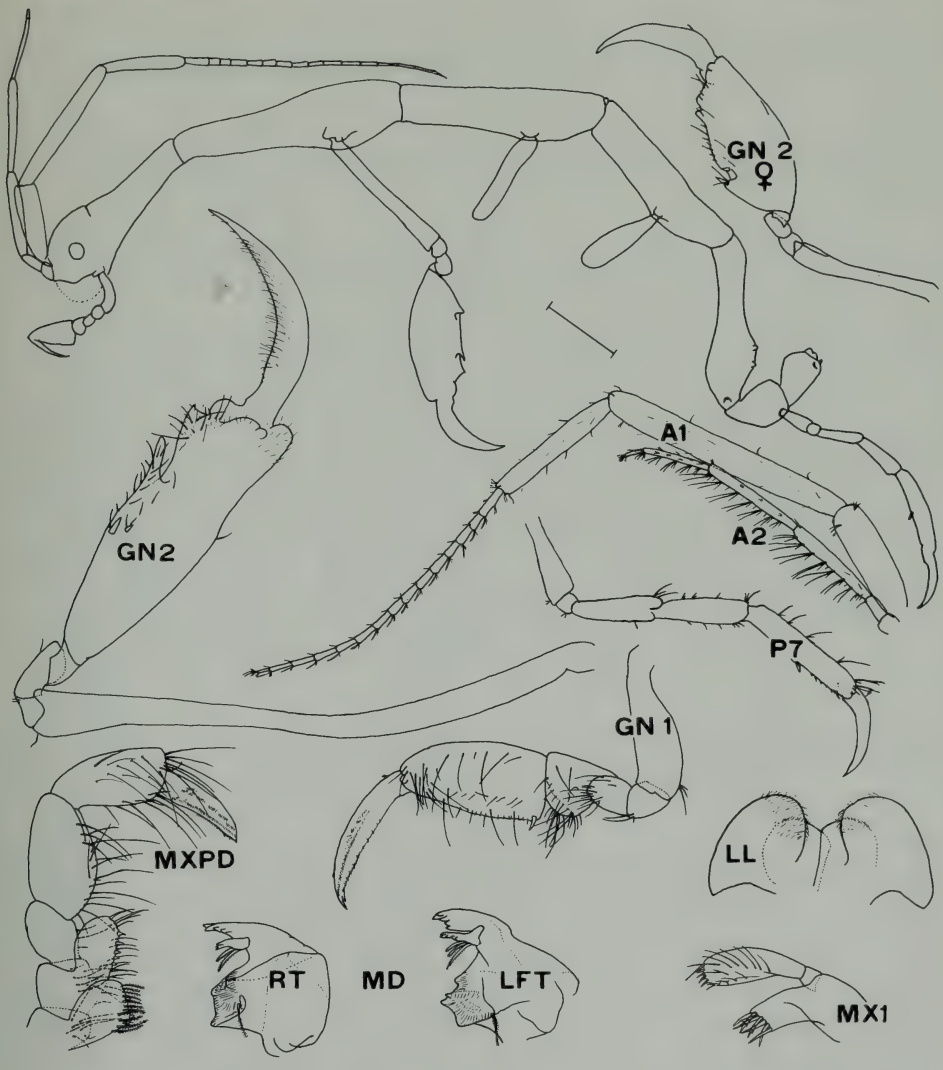


FIGURE 20 — *Caprella gracilior*. Subadult male, lateral view. Male appendages. Female gnathopod 2.

97949—6½

Gills slim, oval.

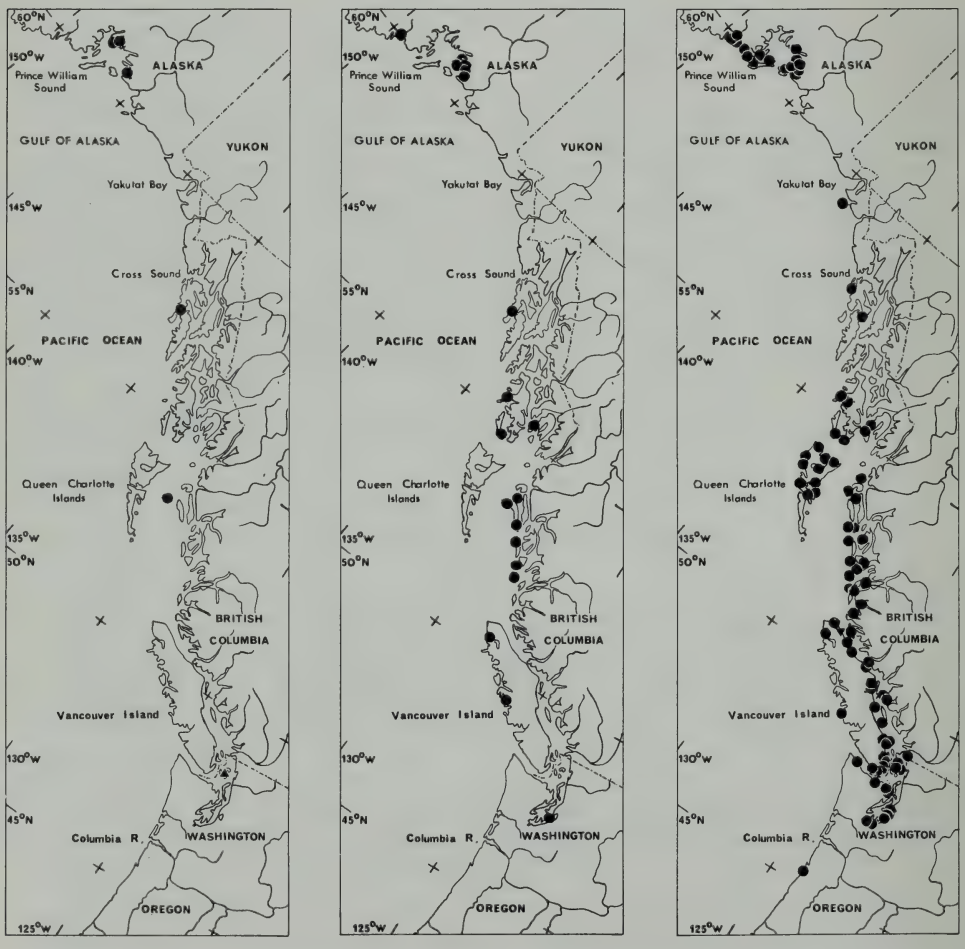
Pereopods 5 to 7 very slender, increasing in length posteriorly; propodus with median grasping spines and no well defined palm.

Abdomen typical of genus.

Female: Length 7.4 mm. Differs from male in showing no lengthening of anterior pereonites; gnathopod 2 arises anteriorly on pereonite II, propodus not particularly slender with palm similar to male but with smaller poison spine, dactylus without hairs. Abdomen typical of genus.

Remarks

This species was separated from *C. linearis* by Dougherty and Steinberg in 1953, a move contemplated by Mayer and justified by the differences between



Map fig. 7 — Known distribution of (a) *Caprella gracilior*, (b) *C. irregularis*, and (c) *C. laeviuscula* within the American Pacific boreal region.

these animals. Mayer cites a few intertidal records for *C. gracilior*, but it would appear that this is a predominantly deep water species, having been found mainly below 30 feet, and down to 958 fathoms.

Distribution

Type locality: not cited, probably Alaska.

Other localities: Aleutian Islands, Pribiloff Islands, and Kodiak Island, Alaska; East Cape, Siberia, USSR; Pacific Grove and Monterey Bay, and southern California; San Juan area, Washington.

New records: Prince William Sound and Alexander Archipelago, Alaska; Hecate Strait, B.C.

Caprella irregularis Mayer 1890 (Figure 21, Map 7)

Synonymy

Caprella irregularis Mayer 1890: 1903 — Holmes 1904 — Utinomi 1947

Material Examined

Prince William Sound: over twenty males, over thirty females, stations A86, A87, A90, A91, A92, A96, A131, 1961; NMC. 10935–10941; USNM acc. 58092.

Alexander Archipelago: nine males, over twenty females, stations A3, A8, A168, A174, 1961; NMC 10933, 10934, 10942, 10943.

Queen Charlotte Islands: six males, two females, station E14c, 1957; NMC 10931.

Hecate Strait: over forty males, over fifteen females, stations H22, H23, H26, H30, 1964; NMC 10944–10947.

Queen Charlotte Sound: fourteen males, fourteen females, stations H49, H53, 1964; NMC 10948, 10949.

Vancouver Island: two males, station O4, 1959; NMC 10932; USNM 172360.

Seattle, Washington: one female, USNM acc. 58092.

Description

Male: Body smooth except for antero-lateral projections on pereonites III and IV, and median dorsal paired spines on pereonite VI; there may also be dorsal paired spines on pereonites V and VII. Length 15.8 mm.

Antenna 1 shorter than cephalon plus pereonite II; flagellum shorter than peduncular articles 1 plus 2 and with fifteen articles; peduncle slightly setose. Antenna 2 shorter than the two basal articles of antenna 1, swimming setae sparse, and absent on flagellum.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus nearly three times as long as broad, and longer than basis; palmar surface with proximal grasping spine plus two accessory spines, one

on each side of palm, distal triangular projection, and large anteriorly pointing poison spine midway between grasping spine and distal projection; antero-distal end of propodus with two projections which jut out on either side of base of claw. Dactylus almost straight proximally, sharply curved distally and with denticulations along inner edge. Basis attached posteriorly on pereonite II and having antero-lateral projection.

Gills small, oval.

Pereopods 5 to 7 increasing in size, propodus with proximal grasping spines.

Abdomen typical of genus.

Female: Length 7.7 mm. Differs from male in showing no lengthening of anterior pereonites; antenna 1 flagellum with twelve articles; antenna 2 longer than peduncle of antenna 1; gnathopod 2 propodus not elongated nor extended

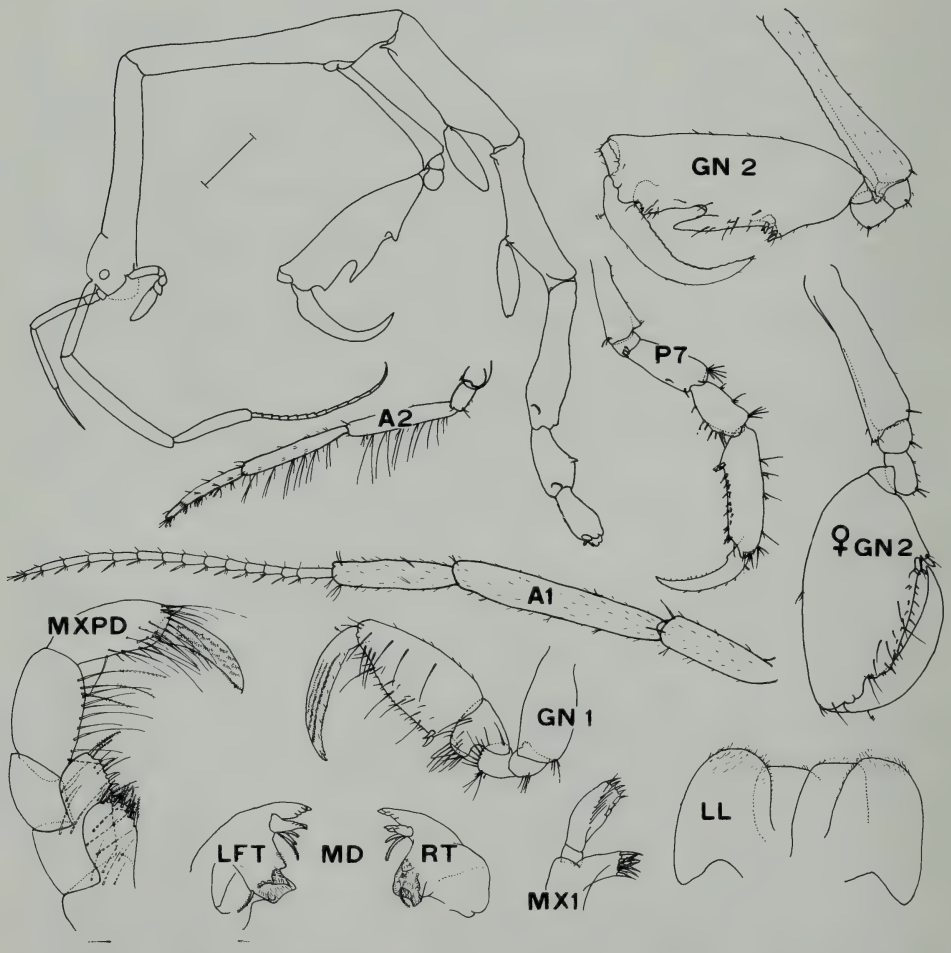


FIGURE 21 — *Caprella irregularis*. Male, lateral view and appendages. Female gnathopod 2.

anteriorly, palm having proximal grasping spine and two accessory spines, distal minute poison spine and more distal rounded projection; dactylus heavy and evenly curved. Abdomen typical of genus.

Remarks

The males of this species are easily distinguished by the shape of the second gnathopod with its anterior wings. The females are very similar to the females of *C. laeviuscula,* but differ from them in having two accessory spines at the base of gnathopod 2 grasping spine, where *C. laeviuscula* have only one accessory spine.

Distribution

Type locality: not cited, probably off Korea.

Other localities: Iliuliuk Harbour, Unalaska, and Prince William Sound, Alaska.

New records: Alexander Archipelago, Alaska; mainland coast of Queen Charlotte Sound and Pacific coast of Vancouver Island, B.C.; Puget Sound, Washington.

Caprella laeviuscula Mayer 1903 (Figure 22, Map 7)

Synonymy

Caprella laeviuscula Mayer 1903 — Utinomi 1943*a*; 1947 — Dougherty and Steinberg 1953; 1954 — Gardella 1962 — Saunders 1966

Material Examined

Oregon; Juan de Fuca Strait; San Juan Islands; Puget Sound; Vancouver Island; Queen Charlotte Sound; Hecate Strait; Queen Charlotte Islands; Alexander Archipelago; Prince William Sound; and Canoe Bay, Alaska: over one hundred lots comprising more than one thousand individuals, NMC 11051–11149; USNM 101292, 173540, 181641, 187867, 163372, 102730, USNM Alaska King Crab Expedition 47-40.

Description:

Male: Head and body smooth except for antero-lateral projections on pereonites III and IV. Length 16 mm.

Antenna 1 equals cephalon plus pereonite II, flagellum shorter than peduncle articles 1 plus 2 and with thirteen articles. Antenna 2 shorter than antenna 1 peduncle, flagellum with swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus less than twice as long as it is broad, and longer than basis; palm with enormous medial-distal poison spine and proximal grasping spine and accessory spine. Dactylus heavy, tapered and curved in distal one third, inner margin denticulate. Basis attached posteriorly on pereonite II.

Gills large, oval.

Pereopods 5 to 7 short, increasing in length posteriorly; propodus with proximal grasping spines.

Abdomen typical of genus.

Female: Length 7.7 mm. Differs from male in showing no elongation of anterior pereonites; antenna 1 flagellum with ten articles; gnathopod 2 attached anteriorly on pereonite II, propodus shorter than arm and having minute poison spine; abdomen typical of genus.

Remarks

Among the specimens of *C. laeviuscula* there are seven lots of smaller specimens; these are adult males of length of 9.6 mm and are comparatively slimmer than the typical specimens. Both male and female (5 mm) are of the smaller size, and, except for one doubtful case, the smaller variety are not found at the same station as the larger type. As no other difference has been observed, and as both varieties are found within the same geographical range, the smaller animals have been included in *C. laeviuscula.*

Of those specimens showing colour, two variations were observed: in one the body was translucent, with varying numbers of small orange polka dots all over body, appendages, and brood plates, but not on gills; in the other, the males were translucent with a few small dark pinkish-brown or black dots on the body, and many such dots on the head and the distal end of the propodus of gnathopod 2, and the females were pink with many such dots on body, brood plates, and distal part of gnathopod 2 propodus but not the other appendages. A few specimens exhibited a mixture of both types of coloration.

Distribution

Type locality: not cited, Pacific coast of North America.

Other localities: Humboldt Bay and (?) Monterey Bay, California; Puget Sound, Washington; Victoria Harbour and Fort Rupert, Vancouver Island, B.C.; Kodiak and Adakh, Alaska; Akkeshi Bay, Japan.

New records: Prince William Sound and Alexander Archipelago, Alaska; Queen Charlotte Islands, Queen Charlotte Sound, Queen Charlotte Strait, Strait of Georgia, Juan de Fuca Strait, and Pacific coast of Vancouver Island, B.C.; Pacific coast of Oregon.

Discussion

C. laeviuscula is the commonest caprellid species in the geographical area investigated. It shows great tolerance of a wide variety of temperature and salinity. It is possible that the different forms found are merely the same species showing adaptation to different ecological conditions. Until sufficient ecological data can be obtained it has been decided to ignore the size differences as noted.

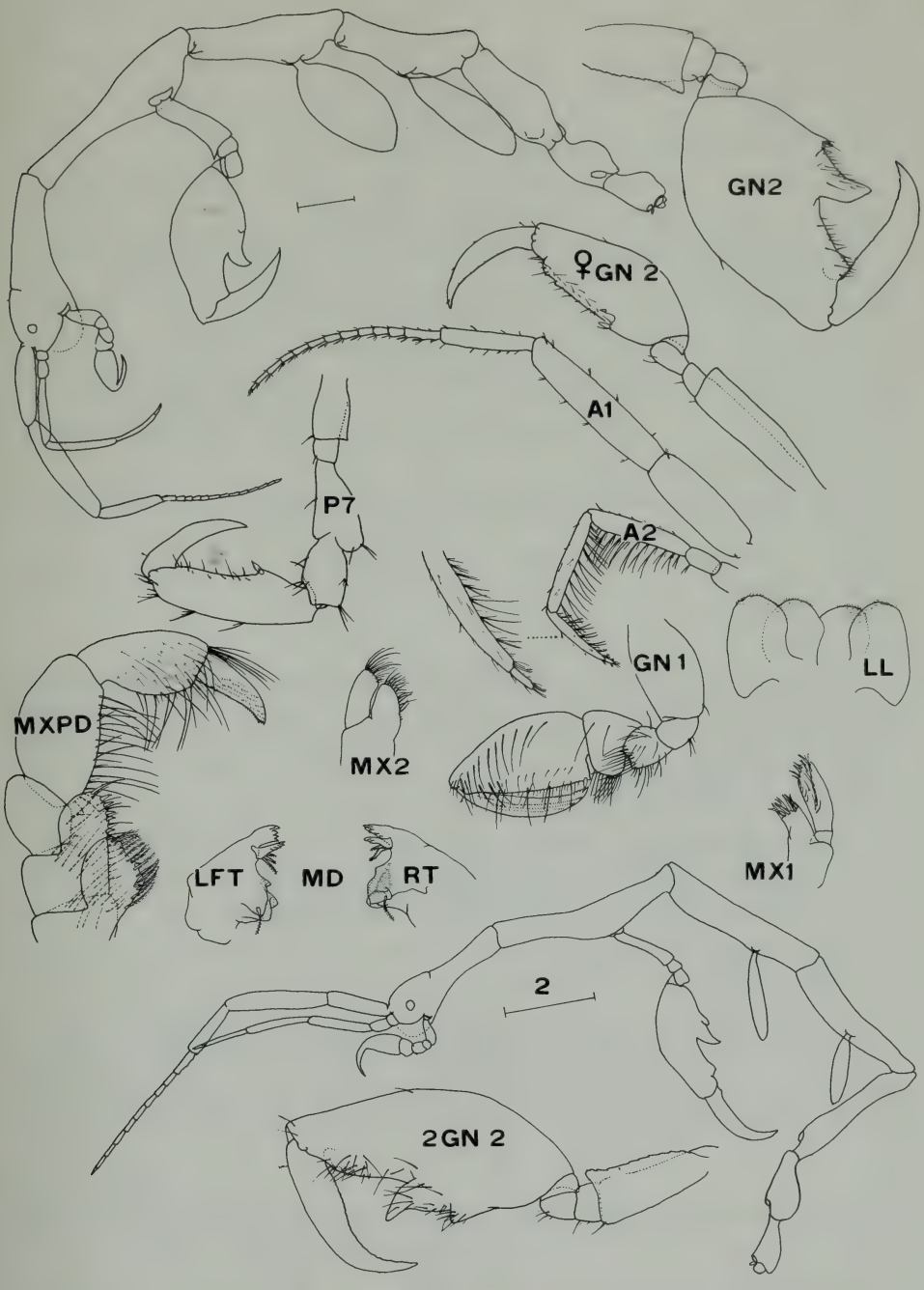


FIGURE 22 — *Caprella laeviuscula*. Male, lateral view and appendages. Female gnathopod 2. *2*: small variety male, lateral view and gnathopod 2.

Caprella rudiuscula n. sp. (Figure 23, Map 8)

Material Examined

One male holotype, NMC 11036, Gudal Bay, Graham Island, Queen Charlotte Islands, station W9, 1957.

One female allotype, NMC 11037, Gudal Bay, Graham Island, Queen Charlotte Islands, station W9, 1957.

Seven males, ten females, paratypes, NMC 11038, 11040–11042, Queen Charlotte Islands, stations W8, W9, W11, W12, 1957.

Eleven males, two females, NMC 11044, 11047, Chichagof Island, stations A22, A168, 1961.

Six males, four females, NMC 11048, Baranof Island, Stations A171–172, 1961.

Twenty-three males, seventeen females, NMC 11045, 11046, Yakutat and Icy bays, stations A71, A73, 1961.

Twelve males, over fifty females, NMC 11039, 11043, Vancouver Island, stations P6c, 1955; N1, 1959.

Eight males, five females, NMC 11050, Koeye Estuary, B.C., station H35, 1964.

Three males, one female, NMC 11049, Porcher Island, B.C., station H10, 1964.

Description

Male: Body with dorsal paired tubercles on head, medianly on pereonites II, III, and IV, anteriorly and medianly on pereonite V; antero-lateral projections on pereonites III and IV. There are also micro tuberculations over most of the body, particularly posteriorly, and also on the second gnathopods and the pereopods. Length 8.5 mm.

Antenna 1 shorter than cephalon plus pereonite II, flagellum shorter than peduncle articles 1 plus 2 and with twelve articles. Antenna 2 approximately equal to peduncle of antenna 1, flagellum with swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate, but not five-toothed.

Gnathopod 1 with serrate grasping margin to propodus and dactylus. Gnathopod 2 propodus less than twice as long as it is broad, palm with giant poison spine, grasping spine and accessory spine proximal to it; dactylus strongly curved and tapered distally. Basis attached posteriorly on pereonite II.

Gills oval.

Pereopods stout, quite short, propodus palm concave, with proximal grasping spines.

Abdomen typical of genus.

Female: Length 4.4 mm. Differs from male in showing no lengthening of anterior pereonites; antenna 1 flagellum has nine articles. Gnathopod 2 pro-

podus shorter than arm, poison spine minute and distal. Abdomen typical of genus.

Distribution

Type locality: Gudal Bay, Graham Island, Queen Charlotte Islands, B.C.

Other localities: Long Beach, Vancouver Island, and Queen Charlotte Sound, B.C.; Alexander Archipelago, Icy Bay, and Yakutat Bay, Alaska.

Discussion

Caprella rudiuscula bears a strong resemblance to *C. laeviuscula* (the specific name, chosen with this in mind, indicates its tuberculate appearance): both have similar general appearance and body proportions and show striking similarities in the form of the second gnathopods. It has been decided to separate *C. rudiuscula* from *C. laeviuscula* mainly because of the tubercles and microtuberculations, and also because of the slight differences in the appendages and mouthparts.

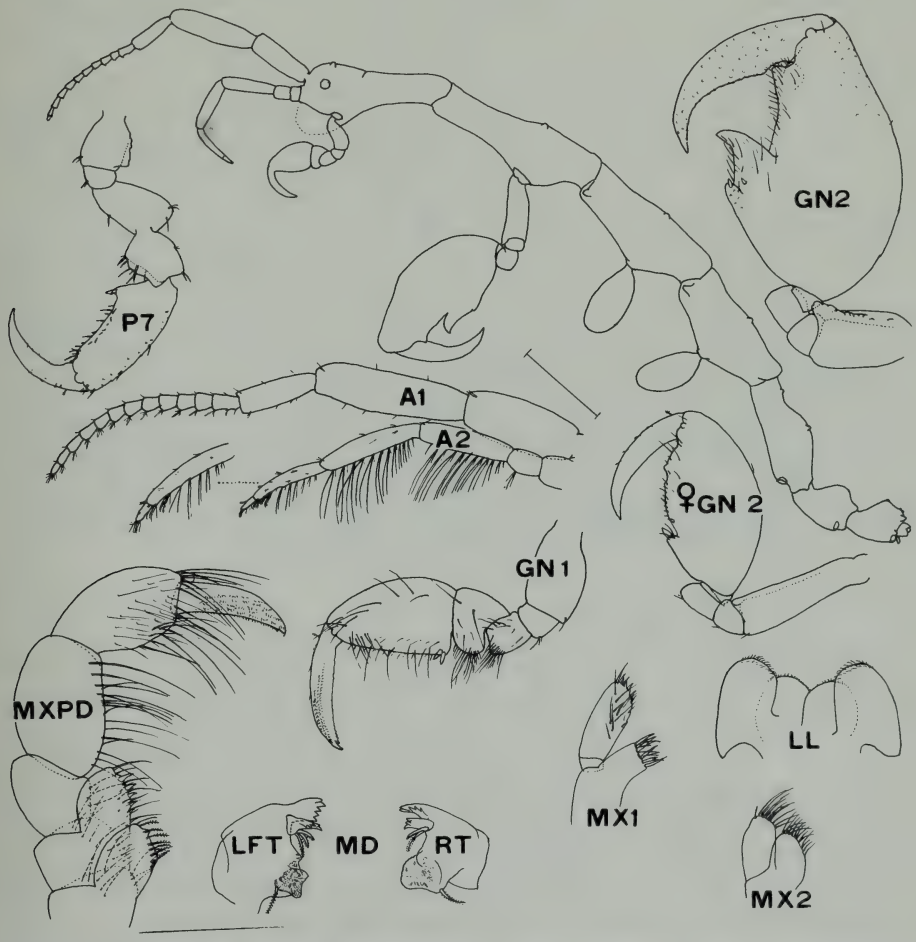
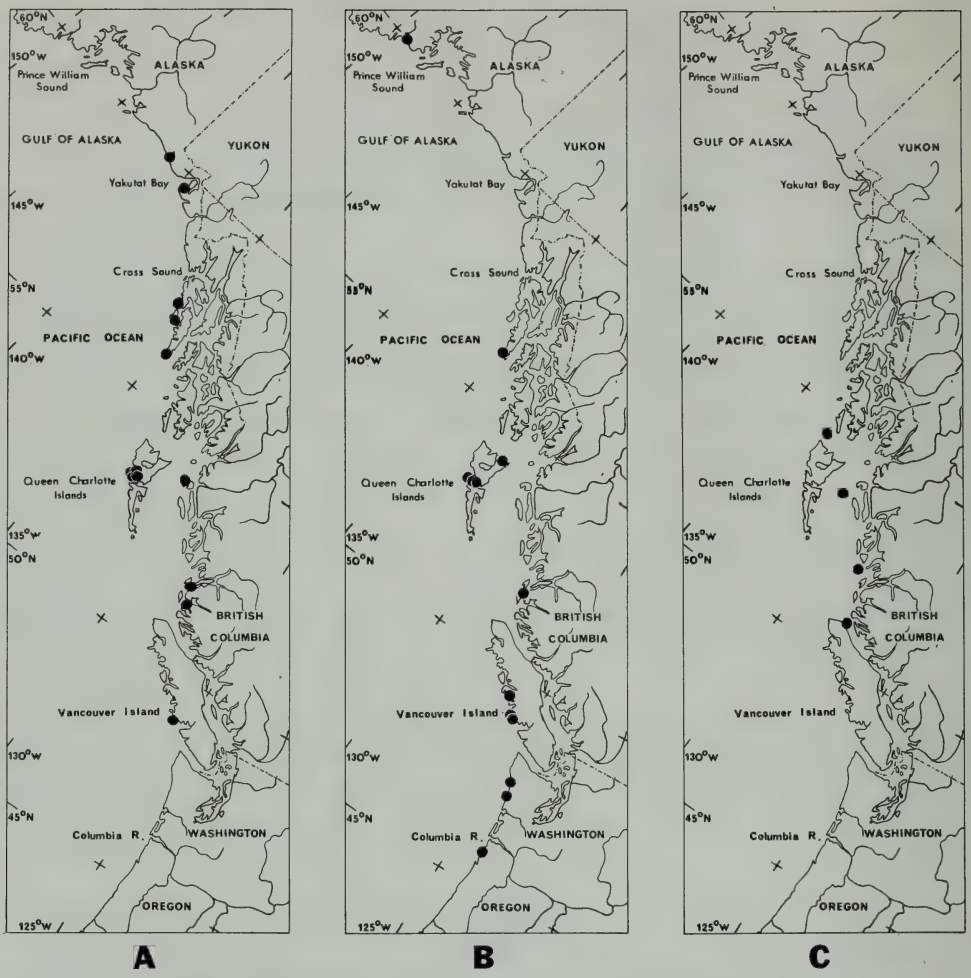


FIGURE 23 — *Caprella rudiuscula.* Male holotype, lateral view. Male paratype, appendages. Female paratype, gnathopod 2.



Map fig. 8 — Known distribution of (a) *Caprella rudiuscula*, (b) *C. pustulata*, and (c) *C. striata* within the American Pacific boreal region.

Caprella pustulata n. sp. (Figures 24, 26, Map 8)

Material Examined

One male holotype, NMC 10840, Gudal Bay, Graham Island, Queen Charlotte Islands, station W11, 1957.

One female allotype, NMC 10841, Gudal Bay, Graham Island, Queen Charlotte Islands, station W11, 1957.

Thirteen male, eleven female paratypes, NMC 10843–10846, Queen Charlotte Islands, stations H14, W9, W11, W12, 1957.

One female, NMC 10848, Prince William Sound, station A129, 1961.

One male, NMC 10849, Baranof Island, stations A171–172, 1961.

Two males, USNM Alaska King Crab Expedition 9-40, Canoe Bay, Alaska.

Nine males, four females, NMC 10850, Koeye Estuary, Fitz Hugh Sound, B.C., station H35, 1964.

One male, two females, NMC 10842, 10847, USNM 172360, Vancouver Island, B.C., stations P6c, 1955; O17, 1959.

Five males, six females, NMC 10851, 10852, Washington, stations W22, W24, 1966.

One male, NMC 10853, Oregon, station W50, 1966.

Description

Male: Head and body, gnathopod 2, and pereopods covered with numerous pustulations of various size, of which only the larger ones are indicated in the figures. Large upward-directed single blunt spine on head, anterior to eyes; aggregations of pustulations anteriorly and posteriorly on pereonites I to IV. Laterally, anterior spines on pereonites II and III, and at base of second gnathopods. The cephalon and pereonites II to V and gnathopod 2 setose. Length 7.9 mm. Cephalon shorter than pereonite II, subsequent pereonites successively shorter than preceding pereonite.

Antenna 1 approximately equal to cephalon plus pereonite II, flagellum with ten articles; first peduncular segment with small dorsal knob distally, all peduncular segments setose; antenna 2 longer than peduncle of antenna 1, flagellum with long swimming setae.

Lacinia mobilis of right mandible toothed, but not five-toothed. Other mouthparts typical of genus.

Gnathopod 1 propodus with two proximal grasping spines, margin of dactylus and propodus serrate. Gnathopod 2 propodus more than twice as long as it is broad, setose proximally and along palmar edge, pustulate distally; palm only slightly concave, with small proximal grasping spine and distal poison spine; dactylus heavy but smoothly tapering to distal end, inner margin serrate. Basis attached posteriorly on pereonite II; short and stout, with lateral and medial anteriorly directed tuberculated ridges. Ischium small, merus twice the size of the ischium and circular, carpus very small and triangular.

Gills small and round.

Pereopods 5, 6, and 7 sturdy, increasing in size posteriorly; palmar surface of propodus concave, with proximal grasping spines, and many spines along its margin.

Abdomen typical of genus.

Female: Length 7.6 mm. Similar to the male except that antenna 1 is not setose, and flagellum has nine articles; gnathopod 2 attached anteriorly on pereonite II, propodus not elongate or setose, grasping spine arises from proximal projection with an accessory spine, and poison spine much reduced; no lateral spines on pereonite II. Brood plates typical of *Caprella.* Abdomen typical of genus.

Remarks

The specific name of this animal is descriptive of much of the surface of the body and appendages.

Distribution

Type locality: Gudal Bay, Graham Island, Queen Charlotte Islands, B.C.

Other localities: Oregon; Washington; Vancouver Island, Koeye Estuary, and Queen Charlotte Islands, B.C.; Baranof Island, Prince William Sound, and Canoe Bay, Alaska.

Discussion

Caprella pustulata is very similar to *C. pilipalma* Dougherty and Steinberg 1953, and a comparison has been drawn with it and the holotype of *C. pilipalma*:

	C. pilipalma	*C. pustulata*
Cephalic spine	dorsally directed, pointed, slim	dorsally directed, blunt, stout
Gnathopod 2	poison spine absent	poison spine distal
Body tuberculations	low and small	raised and large
Gills	elliptical	circular

These differences, along with others, are sufficient to separate these animals into two distinct species.

C. pustulata is even more similar to *C. scabra* Holmes 1904; specimens of this species have not been available to the author, but from the original description certain differences would appear to be present: no mention is made of body nor, particularly, of gnathopod 2 and antenna 1 setation for *C. scabra*; antenna 2 is implied to be much more slender than antenna 1; certain differences are also apparent in the basis of gnathopod 2 and in the fact that *C. scabra* has no proximal palmar spine on the propodus. Holmes mentions the variability of the body spination in his species, so differences here cannot be taken into account.

It can be argued that most of the differences between these two species may be related to differences in the maturity of the animals described, Holmes's specimen being 19 mm long; as *C. pustulata* must be at least subadult, as evidenced by the anterior lengthening of pereonite II, it will have to be considered a distinct species, mainly on the basis of the setation, until evidence to the contrary is forthcoming.

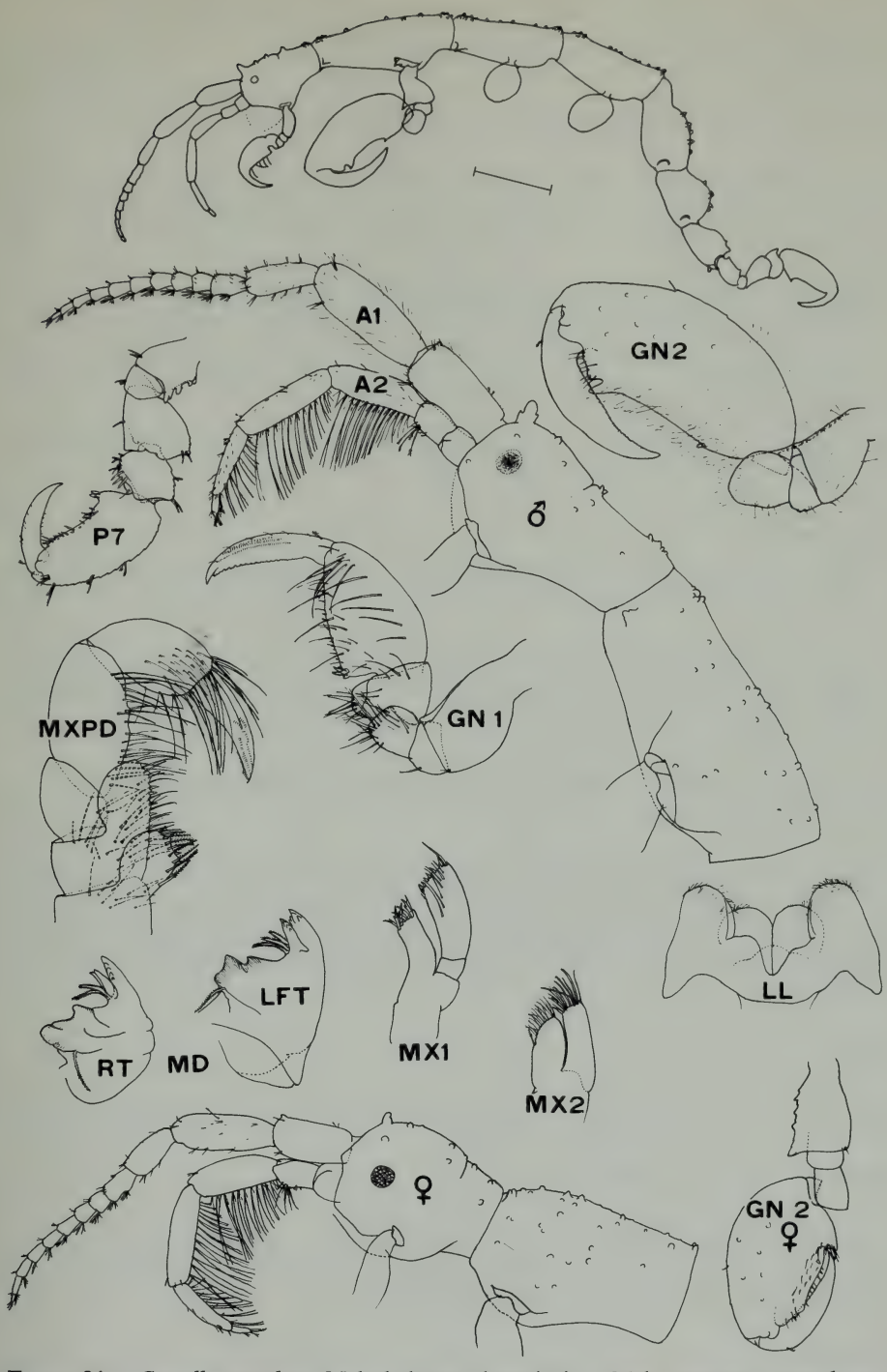


FIGURE 24 — *Caprella pustulata.* Male holotype, lateral view. Male paratype, appendages. Female paratype, gnathopod 2. Male and female paratypes, anterior pereonites showing major pustulations, not to scale.

Caprella striata Mayer 1903 (Figure 25, Map 8)

Synonymy

Caprella striata Mayer 1903

Material Examined

Queen Charlotte Strait: two males, one female, juveniles, station V3, 1959, (30 fm); NMC 10981.

Queen Charlotte Sound: one male, one female, juveniles, station H52, 1964 (38 fm); NMC 10982.

Queen Charlotte Islands: over thirty individuals, stations JWS 85, 1965 (30 fm); WVV 1966 (82 fm); NMC 10983, 10984.

Bristol Bay, Alaska: over fifteen individuals, USNM Alaska King Crab Expedition D4-41 (43 fm), D8-41 (27 fm).

Description

Male: Anterior pereonites normally smooth; posteriorly there may be one or two tubercles on pereonites V, VI, and VII. Length 20.5 mm.

Antenna 1 approximately five-sevenths of the length of the body; flagellum longer than peduncle and having at least twenty-seven articles. Antenna 2 equal in length to peduncle of antenna 1, flagellum with swimming setae.

Mouthparts typical of genus; lacinia mobilis of right mandible denticulate but not five-toothed.

Gnathopod 1 with strongly serrate margin to propodus and dactylus. Gnathopod 2 propodus less than twice as long as it is broad; palm with proximal grasping spine and accessory spine, distal poison spine and triangular projection. Basis attached just posterior to middle of pereonite II, having antero-lateral projection.

Gills oval.

Pereopods 5 to 7 increasing in length, propodus with proximal grasping spines.

Abdomen typical of genus.

Female: Length 9.8 mm. Differs from male in having a shorter antenna 1 with at least seventeen articles in the flagellum; gnathopod 2 attached anteriorly on pereonite II. Abdomen typical of genus.

Remarks

This is primarily a northern, deep water caprellid; depths at which it has been found range from 7 to 150 fm.

Distribution

Type locality: not cited, Alaska.

Other localities: Aleutian Islands and northwestern Alaska.

New records: Dixon Entrance, Hecate Strait, Queen Charlotte Sound, and Queen Charlotte Strait, B.C.

Discussion

No specimens of Mayer's so-called var. *glacialis* were found in the collections examined; this species shows considerable variation in the spination of the body and *glacialis* is probably just an extreme of this variation.

97949—7

Genus *PSEUDOLIROPUS* n. gen.

Antenna 2 without swimming setae, flagellum biarticulate; mandibular palp three-segmented, setal formula for terminal article $x + y + 1$, molar absent (?); outer lobe of maxilliped larger than inner lobe; gills on pereonites III and IV; pereopods 3 and 4 one-segmented; pereopod 5 two-segmented; abdomen of female with one pair of setose lobes and one pair of appendages.

Type species: *Pseudoliropus vanus* n. sp. (by present designation).

Remarks

This genus is very similar to *Liropus* Mayer, 1890, from which it differs in having a two- instead of three-segmented pereopod 5, no apparent molar process, mandibular palp setal formula $x + y + 1$ instead of $1 + x + 1$, and possibly in the female abdomen. The most obvious and significant difference is in the mandibular palp, and it is this character that will determine this genus until more material becomes available.

The generic name is derived from the Greek term *pseudo* = false, in combination with *Liropus*, the genus it resembles.

Pseudoliropus vanus n. sp.

The single specimen, an immature female, was not dissected, but was investigated as a whole mount. Length 5.5 mm.

Antenna 1 with seven articles to its flagellum. Antenna 2 just longer than antenna 1 peduncle, with some long setae on all segments.

Mandibular palp terminal article with long distal seta, and one more medium-length seta than short spine-like process. Maxilla 1 outer lobe with six apical setae.

Gnathopod 1 propodus slim and triangular. Gnathopod 2 propodus stout, palm with 2 proximal grasping spines and some spines and setae.

Pereopods 3 and 4 minute, with three and two apical setae respectively. Pereopod 5 has two apparent segments; distal segment, with one apical and several sub-apical setae, appears to be two fused segments. The pereopod formula should probably be stated as: P3 = $\frac{1}{2}$, P4 = $\frac{1}{2}$, P5 = $2\frac{1}{2}$. Pereopod 6 armed with spines along most of anterior edge; propodus palm with proximal knobs armed with grasping spines, few palmar spines or setae.

Abdomen with anterior setae and posterior minute one-segmented appendages armed with one apical seta.

Remarks

The specific name is derived from the Latin term *vanus* = unsubstantial, referring to the nature of the material on which this species is based.

Distribution

Type locality: off Langara Island (latitude 54°03′N, longitude 134°00′W), Queen Charlotte Islands, August 1965; 600 fm, one immature female, NMC 11150.

97949—7½

ECOLOGICAL AND ZOOGEOGRAPHICAL DISCUSSION

A wide variety of habitats suitable for caprellid amphipods is found along the North American Pacific coast, and an analysis of certain ecological factors was made to determine whether these factors have any effect on the distribution of the caprellids within this region. The significance of this analysis is limited by the small numbers of locality records, along with the seasonally restricted range and non-specific nature of the collections here under consideration. However, despite the limitations of the material, it has been possible to reach the following tentative conclusions on the levels of temperature and salinity tolerance of those species that were found at twelve or more localities.

It was found that whereas the major limiting factor in the distribution of the caprellid species under review was temperature, variations in salinity also had a significant effect.

Most of the species occurred almost exclusively in the 10°–15°C temperature range. However, within this range it was noted that of the species discussed in this paper, *Tritella laevis*, *T. pilimana*, *Caprella angusta*, *C. pustulata*, and *C. rudiuscula* were found at the lower temperatures; *Perotripus brevis* and *Caprella californica* were found at the higher temperatures; and *Metacaprella kennerlyi* and *Caprella laeviuscula* were noticeably more eurythermic than the other species.

The effect of salinity is more difficult to determine. In certain areas (e.g., northern Prince William Sound) the effect of low salinity is probably masked by the effect of low temperature. In other areas, the salinity recorded may not be the normal value for the locality. Thus the salinity recorded near an estuary at low tide will be lower than is normal for the locality. Yearly fluctuations also occur, in regions of large spring runoff (e.g., Strait of Georgia) and glacial melt (e.g., northern Prince William Sound). However, it was found that caprellids were more frequent along the open coast than along the protected coast, which is attributable at least in part to the effect of salinity fluctuations. For example, in the Queen Charlotte Islands region, caprellids were found at 49 per cent of the outer coast stations, but only at 38 per cent of the inner coast stations. In the brackish Strait of Georgia, noticeably fewer species and individuals were found than in adjacent more saline areas.

As the majority of the collections were made in the intertidal and shallow water zones of shores and estuaries, it is probable that the salinity values recorded are lower than is normal for most localities. In view of this it was decided that the generally accepted value of 30 parts per thousand was not a realistic figure to signify the difference between marine and brackish water, and the lower value of 28 parts per thousand was chosen. (For more detailed

discussion of the biological boundary between polyhaline and marine waters, *see* Dahl 1948.) Using this value it was found that *Tritella laevis* and *Caprella angusta* were strongly stenohaline species, and that *Perotripus brevis*, *Tritella pilimana*, *Caprella laeviuscula*, and *C. rudiuscula* were noticeably more euryhaline than the other species (*see* Table 1).

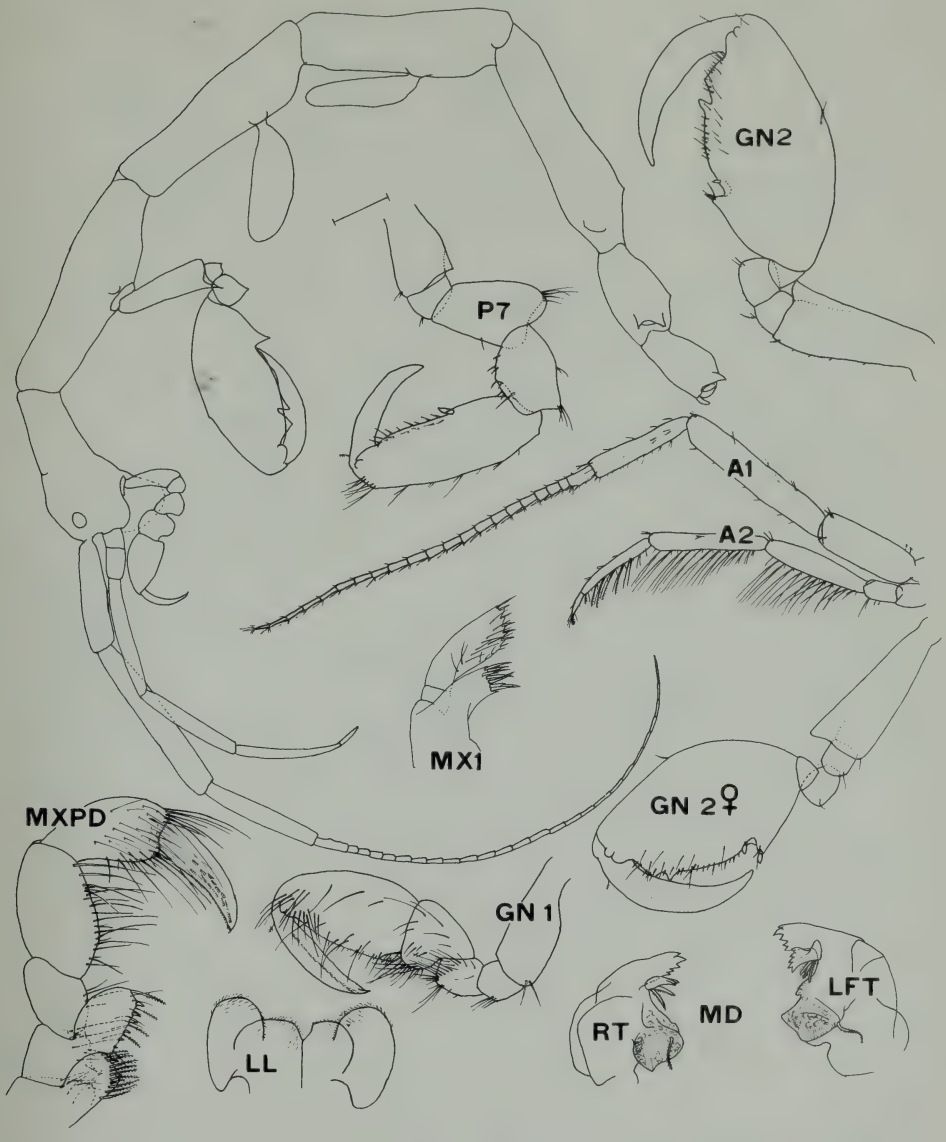


FIGURE 25 — *Caprella striata*. Male lateral view and appendages. Female gnathopod 2.

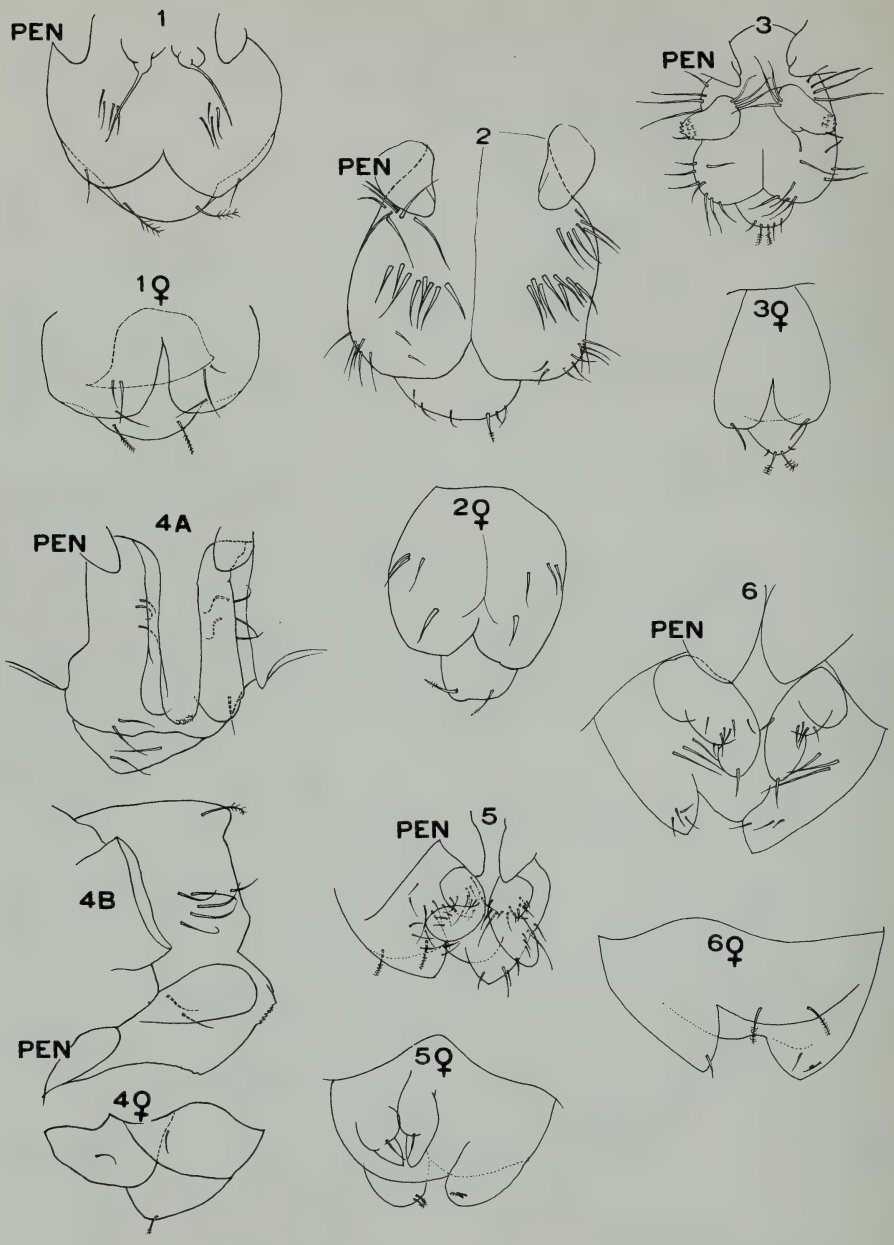


FIGURE 26 — Abdomina of the various genera.
1. *Perotripus brevis*, 2. *Tritella laevis*, 3. *Deutella californica*, 4. *Mayerella banksia:* A. ventral view; B. lateral view, 5. *Metacaprella anomala*, 6. *Caprella pustulata*.

The results of this analysis of the effects of salinity were reflected in the distribution of the species. Thus *Tritella laevis* was found most frequently at Pacific coast stations, while *Perotripus brevis* was found to be typical of the inner passages and bays.

These results refer to the habitat preference of the intertidal species. Consideration must also be given to those species that were found pelagically or sublittorally. Apparently the three species (*Caprella incisa*, *C. laeviuscula*, and *Metacaprella kennerlyi*) that were found attached to floating debris were not in their normal habitat, for the collection data indicate that they were being carried along with surface detritus. Of the species found sublittorally the majority were primarily intertidal species (*see* Table 1). Four species were collected only or mainly at deep-water stations. *Caprella gracilior* (Mayer 1903; Dougherty and Steinberg 1953) and *C. striata* (Mayer 1903) are known to be

Table 1—Ecological Observations

	Number of localities	Vertical distribution				Temperature and salinity tolerance (expressed as ratio)				Location
						Temperature °C			Salinity ‰ <28<	Coast type (expressed as ratio) open: protected
		Pelagic	Intertidal	Subtidal	Sublittoral	5–10	10–15	15–20		
Caprella borealis	8		6	1	1		–		–	–
C. drepanochir	5		5				–		–	–
C. alaskana	18		17	1		2:	15:	0	1:4	2:1
C. irregularis	20		14	2	4	1:	12:	1	1+:2	1:2
C. striata	4				4		–		–	–
Metacaprella anomala	3		2		1		–		–	–
Mayerella banksia	5		1	1	3		–		–	–
Cercops compactus	1		1				–		–	–
Caprella ferrea	7		7				–		–	–
C. pilidigita	4		3		1		–		–	–
C. pustulata	13		13			2:	8:	1	1:7	5:1
C. rudiuscula	13		13			3:	10:	0	2:3	2:1
Perotripus brevis	13		11	1	1	1:	9:	0	2:3	1:5
Tritella laevis	19		19			1:	8:	0	1:7	4:1
T. pilimana	18		12	1	5	4:	7:	1	1:1	1:1
Caprella angusta	17		16		1	1:	13:	1	0:10	2:1
C. californica	21		16	5		0:	13:	2	1:2	1.5:1
C. equilibra	9		9				–		–	–
C. gracilior	5				5		–		–	–
C. incisa	11	1	9		1		–		–	–
C. laeviuscula	89	1	79	7	2	1:	8:1.5		2:3	1:2
C. mendax	4			1	3		–		–	–
C. verrucosa	8		7	1			–		–	–
Metacaprella kennerlyi	28	1	24	1	2	0:	4:	1	1–:2	2:1
Deutella californica	6		6				–		–	–

deep-water species; from the present records it appears that *Caprella mendax* and *Mayerella banksia* are also predominantly sublittoral animals.

The major portion of the North American Pacific is included in the cold temperate (Sverdrup *et al.* 1942) or boreal (Ekman 1953; Schenk and Keen 1936) region. The southern part (i.e., latitudes 30°N–45°N) or 'low boreal' region has not been included in detail in this paper. To the north of the boreal region the subarctic region has also been omitted.

The general boreal region has been divided into zones on the basis of summer surface temperatures. These zones have been further subdivided into exposed and protected coasts. It is felt that such a breakdown is justified by the findings already presented. It should, however, be noted that exposed and protected coasts differ not only in salinity, but also in surf action, available habitats, etc. (cf., Bousfield 1958). On the basis of the caprellid fauna and published hydrographical information (e.g., Bousfield and McAllister 1962), the American Pacific boreal region may be subdivided as follows (*see* Table 2, p. 83).

The *subarctic* zone includes three protected coast areas in which both temperature and salinity are affected by local glaciers, viz: northern Prince William Sound, the glacier coast of southeastern Alaska, and the inner coast of Alexander Archipelago. Here summer temperatures range from 5–10°C, and surface salinities range from 10–30 parts per thousand. This zone appears to have no endemic species but is characterized by *Caprella borealis* and *C. depranochir*, two subarctic species that have been able to reach this region despite the intervening cold–temperate zone of Prince William Sound and the south coast of Alaska.

The *cold–temperate* zone includes both open and protected coastal regions. Here summer temperatures range from 10–15°C.

The *exposed* cold–temperate zone includes the Pacific coasts of Alexander Archipelago, the Queen Charlotte Islands, Vancouver Island, Washington and Oregon, and also California south to Point Conception. Here surface salinities are normally 30 parts per thousand or more (i.e., fully marine).

The *protected* cold-temperate zone includes southern Prince William Sound and inlets of the southern Alaska coast to Seward, the mainland and inland coasts of Hecate Strait south to Johnstone Passage, and the outer reaches of Puget Sound. Here surface salinities are 20–30 parts per thousand and usually 25–30 parts per thousand.

All the species described in this paper were found in the cold–temperate zone. Moreover, the known ranges of the new species *Cercops compactus*, *Mayerella banksia*, *Caprella pilidigita*, *C. pustulata*, and *C. rudiuscula*, and also of *C. ferrea* and possibly *Deutella californica* are limited to this zone. *Perotripus brevis* and possibly *Caprella pilidigita* appear to be protected coast species, while *Tritella laevis* and *Caprella pustulata*, and possibly *C. ferrea*, *C. incisa*, and *C. verrucosa*, appear to be exposed coast species.

The *temperate* zone includes three enclosed regions: the Strait of Georgia, the inner reaches of Puget Sound, and inner San Francisco Bay. Due to the

semi land-locked nature and exposure to river discharge of these estuarine environments, summer temperatures are higher (15–20° C.) and surface salinities are lower (16–29‰) than on adjacent open coasts. Only four species have been recorded from this zone, namely *Caprella californica*, *C. equilibra*, *C. laeviuscula*, and *Metacaprella kennerlyi*. These species are eurytopic and are found throughout the cold-temperate zone also. It is believed that the paucity of caprellids in the temperate zone is more the result of lower salinities than of higher temperatures.

Table 2—Geographical Distribution

1. Number indicates number of stations at which the species was found.
2. × indicates reference in literature.
3. √ indicates inclusion in check-list for the San Juan area.

	Japan and Northwest Pacific	Northwest Alaska	Subarctic glacial			Cold-Temperate (Boreal)										Temperate			
			5–10° C			10–15° C										15–20° C			
			10–30%			30+%						20–30%				15–30%			30+%
			Protected coast			Open coast						Protected coast				Protected coast			Open coast
			North Prince William Sound	Glacier Coast. Alaska	Alexander Archipelago (Inner)	Alexander Archipelago (Outer)	Queen Charlotte Islands (Outer)	Vancouver Island (Outer)	Juan de Fuca Strait	Washington (outer) and Oregon	California (North of Point Conception)	South Prince William Sound	Queen Charlotte Islands (inner) and B.C. mainland	Queen Charlotte Strait and Johnstone Passage	Puget Sound (outer)	Strait of Georgia	Puget Sound (inner)	San Francisco Bay	California (South of Point Conception)
No. of Caprellid Stations			3	3	4	10	19	17	16	12		24	35	14	4	7	3		
Caprella borealis	×		1				4					2	1						
C. drepanochir	×	×										5							
C. alaskana		×				3	5	1	3			2	3	1					
C. irregularis	×	×			1	3		3	√			6	6		1				
C. striata		×					1							3					
Metacaprella anomala	×				1	1					×				1				
Mayerella banksia						1							4						
Cercops compactus						1													
Caprella ferrea						1	4	2			×								
C. pilidigita													3	1					
C. pustulata						1	4	3		3		1	1						
C. rudiuscula				2		3	4	1					3						
Perotripus brevis						1		1	√			2	9						×
Tritella laevis							4	6	3	2	×		2	2					×
T. pilimana							3	1	1	5	×	2	3	3					×
Caprella angusta							2	5	2	3	×		2	3					×
C. californica	×						2	9	×	2	×		7			1		×	×
C. equilibra	×							5	1		×		3					×	×
C. gracilior	×	×	2			1			√		×	1	1						×
C. incisa				1		1		2	2	4	×		1						×
C. laeviuscula	×	×		1	3	5	7	2	12	1	×	15	19	9	3	8	4		
C. mendax											×		3	1					×
C. verrucosa	×						2	4		1	×			1					×
Metacaprella kennerlyi				1		1	4	7	5	2	×	1	2	2	1	1	1		×
Deutella californica								2	1	2	×	1							×

Study of the literature on the caprellids of the North American Pacific shows that forty species, including the six species newly recorded here, have been recorded from the region from Point Conception north to northwestern Alaska. Twenty-seven of these species are apparently endemic to this region. Of the remainder, eleven species are found also in the northwestern Pacific. Six of these species are amphi-Pacific, of which three (*Caprella borealis*, *C. drepanochir*, and *C. paulina* Mayer) are also subarctic, and two (*C. irregularis* and *C. laeviuscula*) are cold–temperate; *C. gracilior* is found throughout the northern and eastern parts of this region. Records indicate that *Metacaprella anomala* may also be an amphi-Pacific species. *Caprella brevirostris* Mayer, *C. californica*, *C. equilibra*, and *C. verrucosa* have not been recorded north of the Queen Charlotte Islands and therefore have discontinuous pan-Pacific distributions. The two remaining species are found sublittorally: *Caprella ciliata* Sars (recorded by Holmes 1904) is found also in the North Sea (Sars 1895; Mayer 1890, 1903), and *C. ungulina* Mayer is found also off Tierra del Fuego and the Galápagos Islands (Mayer 1903).

Caprella is the dominant genus in the north Pacific and is represented by twenty-nine species in American waters. The remaining eleven species come from seven different genera, four of which (*Perotripus*, *Metacaprella*, *Tritella*, and *Pseudoliropus*) are endemic to the Pacific.

Conditions along the North American Pacific coast lead to a diversity of habitats, and even non-specialized collections contain many species of caprellids. Ekman's (1953) general postulation that the North Pacific is faunistically rich is supported by these findings, and also by those of workers in Japanese waters. Bulycheva (1957) has suggested that the American fauna is poorer because of differences in climate. It is suggested here that this is too great a simplification of the differences. The Japanese seas do have a greater range of temperatures, both seasonally and geographically, than the American Pacific at equivalent latitudes. However, the western Pacific also has a more varied coastline, and a broader continental shelf, which apparently gives rise to a greater variety of intertidal and marine habitats. Thus both climatic and geographical conditions can be expected to cause differences in the fauna of the two regions of the North Pacific (*See also* Gislén 1943–44). However, it must be emphasized that the American fauna has been far less intensively studied than the fauna of Japan. It is expected that more specific collecting of caprellids, particularly along the open coast from Cross Sound to Point Conception, will lead to the discovery that this region supports a fauna of comparable diversity to that of Japan.

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